THE

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THE ARCTIC EXPEDITION.

XVI.

Work of the Auxiliary Sledge Parties.

(*Second Part.*)

In our last number we gave some account of the admirable work performed by the auxiliary sledge parties of the 'Alert.' It remains to place on record, in these columns, the similar arduous and useful services of the officers and men of the 'Discovery.'

Egerton and Rawson arrived at Discovery Bay, and thus opened communication between the two ships, on the 24th of March 1876. The whole scheme of spring exploration was then arranged. The main extended party, commanded by Lieutenant Beaumont, with Lieutenant Rawson and Dr. Coppinger in charge of supports, which was to explore the north coast of Greenland, left the 'Discovery' for the 'Alert' on the 6th of April; and some account of the terrible sufferings and heroic conduct of both officers and men will be found in our numbers for December 1876, p. 320, and April 1877, p. 86. The base of operations for this important enterprise, under the lead of Beaumont, was to be the depôt left by the Americans at Polaris Bay, on the opposite shore of Robeson Channel; and Captain Stephenson, therefore, despatched an auxiliary party under Lieutenant Archer, accompanied by Dr. Coppinger, to make a complete inventory of all that was to be found at Polaris Bay.

On the 28th of March, Lieutenant Archer set out with a dog sledge and twelve dogs, his party consisting of Dr. Coppinger, Thomas Simmonds (a first-class petty officer), Daniel Girard (an able seaman), and Hans, the Eskimo, who had been in the expeditions of Kane, Hayes, and Hall. They crossed Robeson Channel in twenty-five hours, including a night's halt, arriving at "Hall's Rest," in Polaris Bay, in the forenoon of the 30th. The distance, as the crow flies, is 28 miles and the ice was very heavy near the shore. The temperature was as low as — 40. After examining the observatory and the grave of Captain Hall, and holding a careful survey on the provisions at the depôt, Lieutenant Archer started again on the 2nd of April, and reached the 'Discovery' on the 3rd, at 9 A.M., the whole journey occupying eighteen hours.

The next work of the 'Discovery' was the exploration of Lady Franklin Inlet, which was believed to be a strait possibly leading to the Palæocrystic Sea. This required the organisation of an extended party, which was placed under the command of Lieutenant Archer. He had a twelve-man sledge, called the 'Westward Ho,' victualled for fifty days, and was supported by Sub-Lieutenant Conybeare, with the eight-man sledge 'Endeavour,' victualled for forty-two days; Conybeare accompanying the extended party for seven journeys, then completing the provisions on Archer's sledge, and leaving a depôt of seven days for the return journey. Captain Stephenson himself, with H.M. dog sledge 'Sir Leopold,' accompanied by Mr. Miller, the Engineer, went with the party during the first week, and saw the explorers well on their way. The names of the crews of H.M. sledges 'Westward Ho' and 'Endeavour' will be found facing p. 314 of our number for December 1876.

The party started at about noon on the 8th of April, Captain Stephenson and Lieutenant Archer going on in front in the dog sledge, as pioneers. On the 12th they reached Cape Straight, which proved to be on an island (afterwards named Miller Island) at the mouth of a large opening called Conybeare Bay. On the 14th they were at Keppel's Head, at the southern end of the bay, and here Captain Stephenson and Mr. Miller took leave of the explorers and returned to the ship. Owing to an accident to the twelve-man sledge, Lieutenant Archer took command of the smaller eight-man sledge, transferring the larger one to Conybeare, who deposited a depôt of 192 rations, and then returned to the ship on the 20th of April.

Archer continued his journey along the western shore of the inlet, which trended in a direct line about south-west. On the 19th he halted opposite to a remarkable hill on the opposite shore, named "Bulley's Lump," after one of the men, and made an unsuccessful attempt to climb to the summit. He reached Record Point on the 20th, where the inlet terminates in two bays named Ella and Beatrix. On the 21st he went up Ella Bay, and ascended a ridge 1200 feet high, but obtained a very limited view, as the surrounding hills are of great height. Next day he took the sledge up Beatrix Bay to the westward, and on the 25th succeeded in reaching the summit of a hill named Mount Neville, a height of 3800 feet above the sea. Towards the north he observed a range of mountains, with glaciers, at a distance of about 20 miles, and far away to the south peaks were visible which he estimated at 5000 feet above the sea. He judged, from the trend of the mountains, that any coast line beyond them could not have a direction to

the southward of S.W. Archer commenced his return journey on the 27th, and arrived on board on the 2nd of May, after an absence of twenty-four days. He found Lady Franklin Inlet to be an opening 9 miles broad at the mouth, leading to a deep, narrow bay, 65 miles long, which has since been named Archer Fiord. At a distance of 20 miles from the entrance it separates into two arms, Conybeare Bay, which is only 10 miles deep on the west, and Archer Fiord, between 4 and 5 miles wide, and forty miles long from Keppel's Head to Record Point. Here it divides into Ella and Beatrix Bays, where the fiord terminates. For the whole length it is bordered by precipitous cliffs, which are of great height at the further end, in one place over 3000 feet sheer. Much of the heavy polar ice is met with until within a few miles of the head of the fiord. The party had no lime-juice, and had no scurvy, which is one more proof of the monstrous absurdity of the conclusion arrived at by the Arctic Scurvy Committee. The termination of the fiord was of course a great disappointment to Lieutenant Archer and his party, as they were equipped for an extended journey; but at the same time this zealous officer completed very thoroughly an important piece of geographical work.

Captain Stephenson, accompanied by Mr. Mitchell, the Assistant Paymaster, left the 'Discovery' in a dog sledge on the 18th of April, and arrived on board the 'Alert' on the 23rd. After having discussed all necessary points with Captain Nares, and received his final instructions, Captain Stephenson set out for the 'Discovery' again on the 30th, and got back by the 4th of May, a very rapid journey, especially as he was confined to his tent for one day by a gale of wind.

On the evening of the 2nd of May, Sub-Lieutenant Conybeare had been despatched to Polaris Bay with the 15-foot ice-boat, to enable Beaumont's party to cross the channel on their return, late in the summer. He came back on the 6th, and on the following day Lieutenant Fulford and Sub-Lieutenant Conybeare set out again for Polaris Bay, with the 20-foot ice-boat. They were followed by Captain Stephenson himself, in the dog sledge, accompanied by Mr. Hart, the Naturalist, and the whole party reached Polaris Bay at the same time, on the 12th of May. There were some large floes of young smooth ice in the channel, but lines of hummocks and heavy nips along both sides, the heaviest being on the eastern shore, with some large grounded bergs. The party at Polaris Bay now consisted of the Captain, two officers, the Naturalist, twenty men, and eight dogs. On the 13th of May, Captain Stephenson hoisted the American flag over Captain Hall's grave, and erected a brass tablet at the foot, which had been brought out from England for the purpose. On the 15th, Dr. Coppinger, with nine men and two sledges, arrived from Repulse Bay, having left Beaumont and Rawson at Cape Stanton, on the 3rd. Fulford and Coppinger then took a depôt of eight days' provisions across the neck of land, 10 miles wide, and placed it on the south shore of Newman Bay, in anticipation of the return journey of Beaumont's party. Captain Stephenson ordered them to lay out this depôt, then to explore Petermann Fiord, and to return to Polaris Bay by the 15th June, so as to meet Lieutenants Beaumont and Rawson. Fulford and Coppinger had with them two men and eight dogs.

On the 17th of May, the Captain, with Conybeare and Hart, and a party of twenty-seven men, set out on their return, arriving on board the 'Discovery' next day, a journey of 27 miles, performed in seventeen marching hours. This was a splendid day's work, as also was the journey of Archer and Conybeare in March. They show that seamen, when the circumstances are equally favourable, can hold their own with the best *voyageurs* in the Hudson's Bay Company's service. On the 22nd of May, Mr. Conybeare was sent to the 'Alert' with despatches, having with him four men (Girard, Hitchcock, Thornback, and Chalkley) and H.M. sledge 'Endeavour.' In this journey Chalkley was attacked by scurvy. Mr. Conybeare was obliged to remain on board the 'Alert' with his sledge crew, owing to the dangerous state of the ice in Robeson Channel. He formed one of the sledge crew which went out to succour Captain Markham's party, and was afterwards away with Captain Markham on a shooting excursion for a fortnight. Altogether he had fifty-two days of sledge travelling.

On the 24th of May, Captain Stephenson and Lieutenant Archer went away with a dog sledge and ten days' provisions, to explore a portion of the coast to the northward of the 'Discovery's' position, returning on the 2nd of June. Mr. Hart (the Naturalist) and Mr. Cartmel (the Engineer) went on an exploring excursion to the head of St. Patrick's Bay from the 5th to the 13th of June; and again from the 23rd of June to the 1st of July to Alexandra Lake, at the head of Musk Ox Bay, with a view to shooting and exploring the neighbourhood.

In obedience to orders received from Captain Stephenson at Polaris Bay, Lieutenant Fulford, after having established the depôt at the south end of Newman Bay, started for the exploration of Petermann Fiord on the 22nd of May. His sledge was named the 'Faith,' after his kinswoman who married John Davis, the great Arctic Navigator, in the days of Queen Elizabeth. He was accompanied by Dr. Coppinger, and had with him Frank Chatel (a first-class petty officer), Hans (the Eskimo), and eight dogs. Chatel was attacked with scurvy, in spite of large allowances of lime-juice, one more proof of the fallacy of the Scurvy Committee's theory.

The travelling was good, and Fulford was able to make a straight course from Hall's Rest to Cape Tyson, a distance of 20 miles, and, passing between it and Offley Island, he reached the margin of an ice barrier up Petermann Fiord at a distance of 13½ miles from the entrance. Here they encamped, but owing to the fissures and water cracks they were unable to penetrate more than 6 miles beyond this point, or 18½ miles from Offley Island. The narrative, by Dr. Coppinger, of the examination of Petermann Fiord and its very peculiar glacier, by himself and Lieutenant Fulford, is of such special geographical interest that we give it in that accomplished officer's own words:—

"On leaving Cape Tyson and Offley Island, which were considered to mark the north-east side of the mouth of the fiord, we saw, some miles before us, an abrupt, precipitous wall of ice, extending in an irregularly wavy but unbroken line from shore to shore. When we had got about 10 miles S.S.E. of Offley Island, the young floe on which we had been

travelling terminated, and was connected through the intervention of a hummock hedge with an old glassy-hummocked floe, over which we proceeded until we reached the margin of the heavy ice above mentioned.

"Here, at 11½ miles S.S.E. of Offley Island, and about 1000 yards from the high precipitous cliffs which form the N.E. shore of the fiord, we made our second camp. The old floe on which we camped was rigidly connected with the heavy ice; in some places the precipitous and cleanly-fractured face of the latter meeting the old floe at a sharp right angle. On examining the surface of the heavy ice, we found it to be totally different in character from that of a floe. It was of glassy smoothness, and so slippery and uneven that walking (in the ordinary sense of the word) was impossible, and to get along at all it was frequently necessary to resort to crawling. The surface was thickly studded with circular pits, about 6 inches deep, and from 1 to 18 inches in diameter, usually containing a little snow and some dark powder, of which I obtained specimens. In general configuration the surface of this ice was arranged for the most part in undulating ridges, extending obliquely down the fiord in a north and south direction, but, as a rule, interrupted by wide fissures and faults, so that few of the ridges were directly continuous for a greater length than 2 miles. The height from crest to furrow was usually about 30 feet, and the slope so steep and slippery that in many places it was quite impracticable to cross the ridges except by cutting steps, or some such contrivance. The furrows, as a rule, had a certain amount of snow bed, and so far as they went, afforded good travelling; but when the ice was devoid of snow, not even a dog could obtain foothold. It is not to be understood from the above that the ice-surface was everywhere disposed in these great ridges and furrows; for there were many patches from 5 to 6 acres in extent of bare ice exhibiting an irregularly undulating surface, from 30 to 35 feet above the water level, and intersected by narrow fissures.

"Having explored all the ice within a day's journey of this camp, and found that by keeping for three-quarters of a mile to the old *floe*, which sent a tongue under the N.E. cliffs, and taking to a furrow of the glacier ice for another three-quarters of a mile, we could advance our position, we packed up and proceeded.

"Our third camp, then, reached on the 25th May, was 13 miles from Offley Island and 200 yards from the N.E. line of cliffs. From 4 miles to the northward of this position, these cliffs presented a vertical face about 1100 feet high, composed of alternating bands of light grey and dark slate-coloured fossiliferous limestone rock, and, from abreast our third camp, were surmounted by an ice-cap, whose blue, jagged edge lying flush with the face of cliffs we estimated at a thickness of 40 feet. The cliffs of the S.W. shore of the fiord presented a similar ice-cap, but of greater extent, as it began about 10 miles to the southward of Cape Lucie Marie—*i.e.* on the south side of the first glacier—and was continuous to the southward as far as the cliffs were seen to extend.

"From both sides the ice seemed to be flowing steadily over the cliffs, as evidenced by frequent avalanches in which great masses of the ice-cap projecting over the cliffs became detached, and carrying with them in their descent masses of rock torn from the face of the cliffs, came thundering down to the floe, marking their flight by dense clouds of snow, and accompanied by a long series of echoes, creating a grand and imposing spectacle. Some idea of the force with which these avalanches came down may be gathered from the fact that large stones were sometimes projected on to the floe to a distance of 80 yards from the foot of the cliffs.

"At this third camp we spent three days devoted to walking excursions. The greatest distance up the fiord to which we could proceed was 6 miles from camp, and to attain this distance we had to run some risks of falling through hidden crevasses, and slipping from high ice slopes into water-chasms; so that we had to content ourselves with making our furthest look-out point on the summit of an ice-pinnacle 18½ miles from Offley Island.

"About 1 mile from us was the nearest glacier of the N.E. shore, two miles beyond it a second, and half a mile further on a third. We had found, as we approached these glaciers, that the main ice of the fiord became more and more fissured, and that the faults in the continuity of the ridges and the furrows were more frequent and embarrassing; but from the eminence now attained it seemed that these glaciers were the nuclei of disruptions of the main ice, and hence the progressively-increasing difficulties of travelling. Carrying the eye along the N.E. line of cliffs, we saw the land terminate abruptly about 20 miles off in a prominent bluff, and from this point to a quarter of the way across the head of the fiord no land was to be seen, but the same extraordinary undulating sea of ice, which, from the main ridges lying in a north and south direction, would seem to be flowing into the fiord in an east to west direction. The fact of our distinctly seeing those ridges at so great a distance was perhaps due to the gradual shoaling of the water up the fiord, and the consequent rise in the elevation of the ice.

"Carrying the eye to the right of a bearing of N. 120° (mag.) from our furthest position, a background of land about 30 miles distant was clearly seen extending behind, and, as it were, overlapping the apparent termination of the S.W. line of cliffs. The latter cliffs presented to the eye an appearance almost precisely similar to that of the N.E. cliffs, and they seemed to correspond as if originally parts of the same land. Both were of about equal height, were equally precipitous, presented the same arrangement of strata, the same description of ice-cap; and both were grooved by glaciers, there being four on the S.W. side and three on the N.E. side of the fiord.

"When about a mile from the nearest glacier we came to a wide fissure, about 30 yards broad, which seemed to extend nearly across the fiord, and whose precipitous glassy walls, 50 feet high from brink to water, we had no means of descending. The bottom of this fissure was composed of treacherous-looking, slushy ice, with a lane of dark water, 2 feet wide, along the middle; so that had we succeeded in getting down, we should probably have been unable to cross. About this same locality were several narrow fissures, some of which, from the very slippery nature of the ice, it was difficult to avoid falling into. One of these, in a tolerably level part of the ice, we found by measurement to be 2 feet wide above, and

23 feet deep, from brink to a probable false bottom of loose snow, on which the light weight of our measuring line rested.

"The ice seemed to be incessantly cracking. Wherever we stood we heard about every half minute a noise varying between the sharp crack of a whip and the report of a guncap, resulting, as we soon discovered, from the formation of thread-like cracks, many yards in length, which formed a kind of network over the surface of the ice.

"The behaviour of the water in the wide fissures was very puzzling. It seemed to rise and fall to a certain extent through the ice, but not enough to account for the whole tidal movement; and we were therefore inclined to believe that the glacier ice was only aground at certain periods of the tide, and that it consequently behaved, in some respects, like a floe, and in others like grounded ice. Not being provided with a sounding line, no estimate of the depth of any part of the fiord was made. However, to solve the question as to the existence of a vertical tidal movement in the ice, Lieutenant Fulford took a series of sextant angles between the summit of the cliff adjoining our camp and a marked spot on the ice, and observing at different periods of the tide, came to the conclusion that there was a certain amount of vertical motion.

"Having failed to get up the fiord by the N.E. side to a greater distance than 18½ miles from Offley Island, Lieutenant Fulford decided on moving round by the edge of the glacier ice to the opposite or S.W. side, and on trying there to discover a more practicable route than we had hitherto encountered. In the latter attempt, however, we were disappointed, for after travelling along the floe under the S.W. cliffs to a distance of 13 miles from Cape Lucie Marie, we found the glacier ice jammed right against the face of the cliffs, and not affording anywhere a practicable route for our sledge. Between the young floe and the glacier ice was a well-marked tidal crack, which extended for three-fourths of the way across the fiord, that is, as far as the young floe and the glacier ice met without the intervention of an old floe.

"On the 3rd June we commenced our return journey; and, stopping for one day at Offley Island, had opportunities of collecting specimens of Silurian fossils, and of observing the glacial planings and scorings which this island exhibits to a remarkable degree. The scorings run uniformly from the summit of the island, at its N.E. extremity to the beach at the S.W. end, grooving successive layers of grey and black limestone. These layers of rock lie horizontally; both are fossiliferous, the grey abounding in fossil corals and molluscs, the black containing corals, but to a less extent. The N.E. extremity presents an abrupt precipitous face, 513 feet high, showing the same arrangement of stratified rock as on the glaciated slope, and closely corresponding with the appearance presented by the opposite face of Cape Tyson, 1 mile distant. Subsequent observations at Cape Tyson showed that in geological formation it corresponded with Offley Island.

"In several particulars the Petermann Fiord glacier presented features deviating considerably from the general rule, which, although already touched on in this report, it may be as well to summarise as follows:—1. The absence of onward sliding motion, probably due to the immobility of the floe in the mouth of the fiord, the low gradient of the glacier, and the prolonged cold season. 2. Its partial subjection to tidal influence for more than a mile above the snout. 3. The absence of detached bergs below the snout. 4. The diminutive height of the terminal cliff, ranging from 16 to 30 feet above the sea level. 5. The presence of water in the fissures 2 miles above the snout, when the mean altitude was 40 feet. 6. The low gradient of the glacier."

On the 7th of June, Fulford's party returned to Polaris Bay, where he found Lieutenant Rawson, who had parted from Lieutenant Beaumont on the 11th of May with orders to bring back a man named Hand, who was suffering from scurvy. Hand walked by the drag ropes, being too ill to pull, the crew consisting of Bryant, Regan, and Elijah Rayner, a gunner of Marine Artillery. This man, Rayner, seems to have had more travelling than any man in the Expedition, namely fourteen days in the autumn with Lieutenant Rawson, fourteen with one of the 'Alert's' depôt parties, and 117 with Lieutenant Beaumont—in all 145 days. Bryant and Regan had very nearly as much. Rayner, the Gunner, is a Norfolk man, then aged twenty-eight. They reached Polaris Bay on the 3rd of June, poor Hand having been carried on the sledge since May 31st, and he died six hours after his arrival at the depôt. Bryant and Regan were also suffering from the same disease.

On the 22nd Rawson determined to meet Beaumont's party with the dog sledge, taking with him Dr. Coppinger, Hans, the Eskimo, eight dogs, and sixteen days' provisions. On the 25th they met Beaumont in Newman Bay, with all his party suffering from scurvy. Lieutenant Beaumont, Alexander Gray (Ice-Quartermaster), and Frank Jones (Stoker) were alone able to drag, the others having to be carried on the sledge, namely, Paul, Jenkins, Craig, and Dobings. On the 28th, Dr. Coppinger took Paul and Jenkins on the dog sledge, and brought them straight to Polaris Bay, but Paul died on the 29th of June, seventeen hours after his arrival. On the 1st of July the whole party arrived, and the others soon began to recover under the watchful care of Dr. Coppinger. Their restoration to health was not, however, due to the lime-juice but to the fresh seal meat, the complete rest, and kindly nursing. On the 12th of July, Lieutenant Fulford, with the dog sledge and two men, Chatel and Regan, proceeded across Robeson Channel to convey the news of the safety of the survivors of Lieutenant Beaumont's party to Captain Stephenson. He found the young ice most treacherous, his people were constantly wet, and Regan fell through. The passage across had, indeed, become very dangerous without a boat, for the pack was in motion, and it was providential that Fulford and his party succeeded in reaching the 'Discovery' without serious accident on July 15th. There is no other instance of any one having crossed such a channel without a boat, so late in the season, over a moving pack.

On the following day Captain Stephenson started for Polaris Bay with an eight-man sledge and six men, a dingey, and medical comforts for the sick. He arrived on the 19th, and remained at the encampment for ten days, during which time the sick made satisfactory progress. Hans, the Eskimo, had been in-

defatigable in procuring game, and 10 seals, 1 musk ox, 36 Brent geese, and a hare were obtained before the Captain left them. He arranged that Lieutenant Beaumont, Dr. Coppinger, two marines and the five sick men should remain until the 5th of August, and on the 29th of July he returned with Lieutenant Rawson, arriving on board the 'Discovery' on the 3rd of August.

On the 21st of July, Mr. Hart (the Naturalist) reported the existence of coal in a ravine in Water Course Bay, the seam extending for a distance of about 250 yards by about 25 feet broad above the bed of the water-course, and extending beneath it. Mr. Cartmel blasted some portion of the seam to a depth of 5 feet 6 inches from the surface, and some 60 lbs. of coal were obtained, quite equal to Welsh coal, almost smokeless, and burning to a very small quantity of white ash.* On the 28th of July the whole of the winter's ice disappeared from Discovery Harbour. On the 1st of August, Lieutenant Archer and Mr. Hart hauled the seine in Alexandra Lake, and caught several salmonoids, which were preserved as specimens. On the 6th, Mr. Egerton arrived overland, with news that the 'Alert' was approaching, and in the same evening Lieut. Rawson set out for the 'Alert,' with news of the absence of Beaumont's party in Polaris Bay. He returned on the 8th, and on the way he performed a remarkable feat. At the head of St. Patrick's Bay he came upon a musk ox, but he had no gun. He, therefore, fastened a knife to his alpenstock, induced the animal to charge him by throwing stones, and at length succeeded in killing it. On the 9th, Rawson and Egerton, with three men, went again to St. Patrick's Bay, to look out for Lieutenant Beaumont's party.

In the evening of the 8th of August, Beaumont and Coppinger left Polaris Bay with the 15-feet ice-boat, and the sledge towing astern. Sometimes they dragged the boat across a floe on the sledge; at others they launched the boat to cross a lane of water, towing the sledge after them, being drifted to the south all the time. By the 11th they were south of Cape Lieber, the ice breaking up all round them. The change from sledging to boating was frequent and hurried, and the position was becoming very critical. At length they reached the western land between Capes Lieber and Baird on the 12th of August, the men dead beat. Next day they started again, worked hard for twenty-two hours of dragging, and then encamped. They were just preparing to start again. when they heard a cheer, and found that Captain Markham had come to the rescue from the 'Alert.' After a warm welcome on board that ship, they reached the 'Discovery' on the 15th of August 1876.

Thus ended the sledge travelling of the 'Discovery,' officers and men having worked hard and continuously since the end of March, a period of fully four months, during which time they had nobly performed their share of the great and glorious work of Arctic discovery. Besides keeping up communications, laying out depôts, and bringing succour, the auxiliary parties of the 'Discovery' explored Archer Fiord, carefully examined the Petermann Fiord, and discovered the important coal seam in Water Course Bay. Like their comrades of the 'Alert,' they were indefatigable, intrepid, untiring, and consequently successful.

Captain Stephenson himself was away 52 days, during 37 of which he was actually travelling. Beaumont was away 127 days, during 88 of which he was actually travelling; Coppinger 133, Rawson 139, Archer 41, Fulford 69, and Conybeare 52 days. Including the 'Alert' trips of May and Egerton, Robeson Channel was crossed no less than twenty-eight times, by different travelling parties. In fact, they were incessantly at work during the whole sledging season.

Actual distances depend entirely on the character of the ice, and nothing can be more unfair and misleading than to adopt them as a standard of comparison. It may, on the contrary, be safely assumed in Arctic travelling that long marches are another word for easy work, and that short distances betoken the most gallant and persevering struggles against almost insurmountable difficulties. In Arctic sledge travelling the true tests of good work are the dates of starting, and the number of days of absence. Judged by these tests the Arctic Expedition of 1875-76, both as regards its autumn and its spring travelling, stands in the very first rank. The average absence of its extended parties was ninety-three days, of its auxiliary parties forty-five days, and of all its parties fifty-six days.

A careful examination of the sledging journeys of 1875-76 proves that every detail was attended to; that all the arrangements were ably and judiciously made; that each separate journey formed a necessary part of one harmonious plan directed, with great skill, towards securing the objects of the Expedition; and that the work, so admirably conceived by Captain Nares, was, in the face of unparalleled difficulties and sufferings, most gallantly executed by the officers and men under his command.

* See also our number for January 1877, p. 2.

THE SCURVY REPORT.

II.

It will be our duty to return to the subject of the Scurvy Committee's Report on other occasions, because, in the interests, not only of truth and fairness, but of the advancement of geographical knowledge, which it will very injuriously affect if its fallacies are not thoroughly exposed, it must not be allowed to remain unchallenged. On the present occasion we reprint a letter written by Sir Leopold McClintock on the subject, as well as the remarks of Mr. George Murray, an old Arctic petty officer, who served in three expeditions.

Geographers, throughout the world, will accept the following generous letter written by Sir Leopold McClintock, the greatest of living Arctic authorities, as outweighing all the censures of all the Boards of Admiralty and Committees that ever sacrificed justice to supposed expediency. It was published in the *Army and Navy Gazette* for June 2nd, 1877:—

"Sir,—Will you kindly allow me through the medium of your paper to make known one or two facts bearing upon the health of the Arctic sledging crews and the recent enquiry respecting the outbreak of scurvy

in the Arctic Expedition, as I think it due to Sir George Nares and his officers that former Arctic experience should not be lost sight of? If Sir G. Nares erred in not having supplied his sledge parties with lime-juice, then we Arctic travellers have all likewise erred. I have myself made several sledging journeys, varying in length from twenty to one hundred and five days each, without either lime-juice or scurvy in any of my parties; and the experience of my brother officers in the Franklin search agreed with my own. Briefly, we lived upon pemmican, and enjoyed sound health. Therefore, acting as I have always done upon experience, when obtainable, in preference to any number of suggestions, however valuable they may appear, had I been in Sir George Nares' place I also would have left the lime-juice behind.—I am, &c, LEOPOLD MCCLINTOCK."

The editor adds the following remark:—

"This is a very remarkable and decisive expression of opinion, and coming after the Report of the Committee, which contained what was nothing more or less than an emphatic condemnation of the course Admiral McClintock declares he would have pursued, may cause those who assailed Sir G. Nares so vigorously to reflect a little, and to see that there are two sides to the question."

We are glad to be able to add the following remarks from another authority. Mr. George Murray, who is now entering upon an honoured old age, after a long and useful career, has been at sea since his boyhood, and has served for many years both in the royal and the mercantile navies. He was in the Arctic Expedition of 1848-49, under Sir James Ross, and was a Quartermaster in the subsequent expeditions of 1850-51, under Sir Horatio Austin, and of 1852-54, under Sir Henry Kellett. He served with McClure, McClintock, Osborn, and Hamilton; and was in the extended sledging parties in all three expeditions. Those who have served with George Murray know him as a shrewd and accurate observer, and as a man of no mean literary attainments. He says:—

"You do me the honour to ask my opinion on the lime-juice question, I shall give it you in a few words. Notwithstanding that I attach considerable value to lime-juice as an anti-scorbutic, I deny that it has anything like a specific remedial action on the disease. The allegation made and tenaciously adhered to by some in 'high places,' that the sole cause of the outbreak of scurvy in the late Arctic Expedition was the absence of lime-juice from the sledge diet, is to me a proposition so absurd, so opposed to reason and experience, that I deem it unworthy of a moment's consideration. My belief is—and I think there can be no question about it—that the disease was engendered in the men's systems during the winter, the time when they were drinking regularly their daily allowance of lime-juice. So much for the 'precious cordial' as a preventative. The spring came (the most favourable season for the development of scurvy), the sledge parties started on their several journeys, and they were scarcely out of sight of the ships when the debilitating influence of the disease became apparent. Lime-juice had not proved a preventative during the winter, and no amount of it then would have effected a cure so *efficaciously* as to enable the men to undergo the fatigues and privations of a Polar journey. The question, 'How did scurvy originate—what where its exciting causes in an expedition said to be so magnificently "found"?' is one that will never be answered to the satisfaction of everybody. My own reply is, the long absence of the sun, the unprecedented low temperature, and not being able to procure any genuine fresh meat, such as game, &c.

"During my long career at sea in the mercantile and royal navies in all parts of the globe, I have seen much of scurvy, and some deaths from it, and I reiterate that lime-juice has nothing like a specific remedial action on it.

"It has been alleged by some wise folks that the officers of the late Expedition escaped scurvy through not being so hard worked as the men. No allegation could be more false. What, I ask, would have become of the sledging parties but for the indomitable pluck of these officers? They would have perished.

"Experience has long since told me that the higher the intelligence, the greater the physical endurance. The organ which phrenologists call *Love of approbation* appears to develop with education. To an educated man of high spirit failure in a great enterprise is death. The saying attributed to the Duke of Wellington, 'What will they say in England?' is ever on his lips. This leads me to remark, that if ever the North Pole is reached by sledges, those sledges will be manned with officers

"I should be sorry to see the reputation of Sir G. Nares sacrificed to a mere medical dogma, a dogma in the worst sense of the word, as being not only assertion without proof, but an assertion opposed to experience.

"In my first voyage in search of Franklin, under Sir J. Ross, the provisions were wretchedly bad, the salt meat frequently boiling away to half its original weight. The preserved fresh meats were so bad that they became the subject of an inquiry on the expedition's arrival in England. Sir James was not fortunate in his crew; he was a big man himself, and he was fond of big men, and on travelling with him the big men all broke down. His travelling allowances were 1 lb. meat, 1 lb. of biscuit, rum, chocolate, and lime-juice. He did not start before the middle of May. Out-door exercise all day; building snow-house and snow-walls. He had no pemmican.

"In the two following expeditions the provisions were of the *very* best quality, and the allowance most ample. The travelling allowance for the extended parties was—pemmican 1 lb., pork 6 oz., ¾ lb. biscuit, bread-dust to mix with the pemmican, rum, tea, and chocolate. None of the extended parties of either of the two expeditions carried lime-juice.

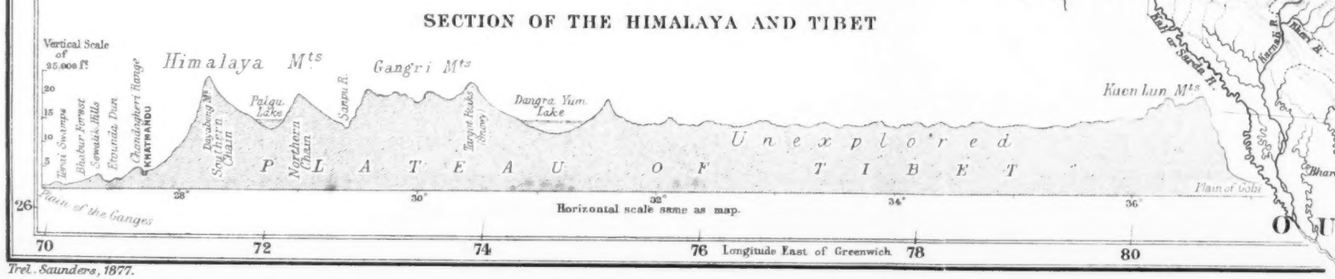
"The outdoor exercise in either of the expeditions could scarcely be said to be compulsory until the spring, when the men were compelled to take long walks every day to inure them to travelling. In the second winter, under Kellett, discipline became rather lax, every man doing as he liked with regard to exercise. Still, all were healthy, and in the spring, on abandoning the ships, started on their journey to the 'North Star,' Beechy Island, in sound health and high spirits. On arriving at the 'North Star,' they had to cut that ship out, and, in doing so, had, while at the saws, to stand up to the middle in water.

THE HIMALAYA AND TIBET

a view of the Mountain System bounded by the plains of India, Gobi, China, and the Caspian.

English Miles 20 10 0 20 40 60 80 100 Heights in Feet

SECTION OF THE HIMALAYA AND TIBET



Trel. Saunders, 1877.

LAYA AND TIBET

by the plains of India, Gobi, China, and the Caspian.

20 40 60 80 100 Heights in Feet

88 90 92 94 96 98 100 102 104 106

a m o Desert

t a i n s

I N E S E

Sources of the Yang-tse

Dassun L.

Chaidam R.

Elesu Nor

Polonker R.

K O K O N O R

Koko Nor 10,485

Sining

K A N S U

Hwang Ho

Lan-chou

Ho

Tie-tsun R.

Ling-tao

E M P I R E

Kukusai R.

Xamisitu R.

Toktonai Ulan

Murus Ussu R.

Alak L.

Tagun L.

Charing Nor

Oring Nor

Gaschun Nor

Katsi R.

Akkun R.

Gayuk R.

Tonpuru Mts

Oceanic 16,050

B a y a n K a r a Mountains

Hwang Ho

Kiai

Liyar L.

Yarghia Zangpu R.

Hiu R.

Tupur L.

Charolo Mts

S o k (Mongolian Tribes)

P a

T i b e s

I

B

Tsida L.

Eldzighen L.

Katshi R.

Temen Mt

Gatrum L.

Ram L.

Kentacla Mts

Long-gan

Heashui

Shoshul

Pustang Mt

Raliap Mt

Ryvudze

Amdo

Yunnai

Ching-tu

Mao

Chamtu

Kwankin

Makiu

Chun

Lithang

Gunjuk

Pemsasili Mt

Bukchak R.

Kara L.

Kara Ussu R.

Mitoc L.

Chargut Cho

Tang Jung Cho

Chicut Cho

Kyuring Cho

Mokieu Cho

Tarru Cho

Tengri or Namcho

Inbgang La

Nam-ling

LHASA 11,910

Gobar Pass 18,650

Dar

Chomto Mt

Kempu R.

Cholga

Yang R.

Min R.

Jalawen

Pingshan 1500

Raka Sangpu

Janglatsche 13,600

Shikadze

Tsinam R.

Patu

Chetang 11,480

Sampu R.

Jeladang

Batang

R. Kincha or Yang-tse

S Z - C H U E N

R. Tatung

Yungning

Yen-yuen

R. Lopra Cha

22,370

Ombu R.

Sullivch

R. Nu or Salwin

R. Lantsan or Cambodia

R. Irawadi

Likiang

Y U N N A N

M

A

B U R M A H

Brahmaputra R.

Tezpur

Darjiling

Tista R.

Teesta R.

Tchong R.

Dihong R.

Dibong R.

Lohit R.

Mishmi Mts

Mishmi

Kamlang

Kong R.

Thamo R.

Mo R.

Kara R.

Tsangpo R.

Tungal R.

Mt. Everest 29,002

Chomolonzi Mt. 23,944

Dunkia 23,766

Chumulari 23,929

Kinchinjunga 24,797

Phalung 21,965

Donkia Pass 19,190

Chomiomo 22,260

Tassogong

Towang

Tongsa

Punaka

Chumbi

Phari

Ta-chien-lu

Ya-chou

Ya-lung R.

Ya-lung

Ta-tu R.

Ta-tu

Min R.

Kiu-chang

Ling-chang

Ho

Tie-tsun R.

Lan-chou

Ling-tao

Hwang Ho

Sining

Koko Nor 10,485

Elesu Nor

Polonker R.

Chaidam R.

Dassun L.

Kukusai R.

Xamisitu R.

Toktonai Ulan

Murus Ussu R.

Alak L.

Tagun L.

Charing Nor

Oring Nor

Gaschun Nor

Katsi R.

Akkun R.

Gayuk R.

Tonpuru Mts

Oceanic 16,050

Liyar L.

Yarghia Zangpu R.

Hiu R.

Tupur L.

Charolo Mts

Sok (Mongolian Tribes)

POINTS ON THE HIMALAYA MOUNTAINS ARRANGED IN ORDER OF LONGITUDE.

(Extracted from the MS. Records of the Trig. Surv. India, Vol. 15, 1861.)

	Name of Peak.	Lat.	Long.	Alt
I.	Choomalari	27° 49′ 37″	89° 18′ 43″	23944
II.	Gipmochi	27 16 23	88 56 37	14518
III.	Powhoonri (or Donkia)	27 56 52	88 53 5	23186
IV.	Choomoonko (or Chola)	27 27 28	88 49 38	17325
V.	Black Rock (Guaream)	27 34 7	88 48 29	17572
VI.	Narsing	27 30 36	88 19 28	19146
VII.	Pandim	27 34 34	88 15 35	22017
VIII.	Kanchinjinga	27 41 26	88 11 50	27815
IX.	,,	27 42 5	88 11 26	28156
X.	Kabroo	27 36 26	88 9 15	24015
XI.	Jannoo	27 40 52	88 5 13	25304
XII.		27 39 55	87 7 56	—
XIII.	(Sihsur)	27 53 18	87 7 54	27799
XIV.	(Chamlang, East)	27 46 27	87 1 21	24020
XV.	Mount Everest	27 59 12	86 58 6	29002
XVI.	(Chamlang, West)	27 45 16	86 51 56	22215
XVII.	(Sankosi)	27 45 11	86 36 57	22826
XVIII.	(,,)	27 52 46	86 31 57	21987
XIX.	(,,)	27 58 13	86 28 32	23570
XX.	(,,)	27 57 48	86 22 42	23447
XXI.	(,,)	27 57 24	86 9 8	19560
XXII.	(Jibjibia)	28 7 36	85 54 42	21853
XXIII.	(,,)	28 21 3	85 49 21	26305
XXIV.	(,,)	28 10 20	85 49 17	22891
XXV.	Dayabang	28 15 17	85 33 35	23762
XXVI.	(Aku)	28 23 25	85 10 12	24313
XXVII.	(,,)	28 20 38	85 7 24	23313
XXVIII.	(Yassa)	28 25 58	84 41 0	25818
XXIX.	(,,)	28 30 7	84 36 34	25729
XXX.	(,,)	28 32 55	84 36 9	26680
XXXI.		28 39 39	84 21 56	—
XXXII.		28 39 21	84 20 32	—
XXXIII.	(Barathor)	28 29 18	84 13 56	22947
XXXIV.	(,,)	28 32 0	84 9 52	26069
XXXV.	(,,)	28 32 6	84 7 32	24718
XXXVI.	(Morshiadi)	28 34 58	84 1 57	24780
XXXVII.	(,,)	28 29 37	83 59 22	22964
XXXVIII.	(,,)	28 29 48	83 59 20	22086
XXXIX.	(,,)	28 35 38	83 51 46	26522
XL.	(,,)	28 30 59	83 50 55	23641
XLI.	(,,)	28 39 11	83 46 22	22471
XLII.	Dhoulagiri	28 41 43	83 32 9	26826
XLIII.	(Narayani)	28 45 39	83 25 52	25456
XLIV.	(,,)	28 45 8	83 25 12	25299
XLV.	(,,)	28 43 56	83 24 18	24912
XLVI.	(,,)	28 44 2	83 21 20	25095
XLVII.	(,,)	28 40 21	83 19 6	23565
XLVIII.	(,,)	28 43 49	83 15 9	24181
XLIX.	(,,)	28 44 47	83 11 18	23779
L.	(,,)	28 44 30	83 9 29	21727
LI.	(,,)	28 45 53	83 8 27	21472
LII.	(Chaubisi)	28 49 33	82 39 33	19415
LIII.	Api	29 59 7	80 56 22	—
LIV.	Panchachuli	30 12 51	80 28 9	22673
LV.	(,,)	30 15 12	80 25 5	21471
LVI.	Nandakut	30 16 51	80 6 39	22538
LVII.	(Nanda Debi, or Latu)	30 21 58	80 2 21	24417
LVIII.	Nanda Debi	30 22 31	80 0 50	25661
LIX.	(,,)	30 22 35	80 0 46	25587
LX.	East Trisool	30 16 14	79 54 51	22342
LXI.		30 30 56	79 54 31	23002
LXII.	West Trisool	30 18 43	79 49 7	23382
LXIII.	(Nandakna)	30 22 9	79 45 40	19916
LXIV.	Nandakna	30 20 56	79 45 36	20722
LXV.	,,	30 20 57	79 45 35	20773
LXVI.		30 41 6	79 44 53	22093
LXVII.	Kamet, or Ibi Gamin	30 55 13	79 38 4	25373
LXVIII.	Nilakanta	30 43 52	70 26 56	21661
LXIX.	Badrinath	30 44 16	79 19 20	23210
LXX.	(,,)	30 43 22	79 17 52	22511
LXXI.	(,,)	30 46 44	79 16 58	22347
LXXII.	Kedernath	30 47 53	79 6 34	22790
LXXIII.	(Tharlasagar)	30 51 40	79 2 14	22582
LXXIV.	Tharlasagar	30 51 41	79 2 13	22628
LXXV.	Jaonli	30 51 18	78 53 53	21672
LXXVI.	Bus Peak, or Srikanta	30 57 25	78 50 50	20149
LXXVII.	Banderpoonch	31 0 12	78 35 45	20758
LXXVIII.	Jamnotri	31 0 25	78 34 6	20038
LXXIX.	Sargoroen	31 6 8	78 32 32	20405

All these peaks are on the Southern Chain except LXVII., which is on the Northern. Many peaks have been observed, since this list was made, on each of the three chains; and some of them, on the Southern and Northern Chains, are included in the list compiled by Prof. Robert von Schlagintweit, from which the names in parenthesis are taken.

Still, no one complained of illness of any kind—a proof that they were just the right men for hard service.

"I may remark here, that during the time I served in the three above-mentioned expeditions, I never drank a drop of lime-juice. I never in my life liked it, and always bartered it for rum. If a total abstainer, perhaps you will be horrified at such a confession. There were many others in the several expeditions in the same category with myself, and I can conscientiously declare that none of us ever had the slightest symptom of scurvy."

THE HIMALAYAN SYSTEM.

(A further reply to an Article in the "Calcutta Review" for January, 1877.)

THE snowy peaks of the Himalaya, which are seen in a continuous line from the plains of India for the great length of nearly two thousand miles, have their southern base in those lowlands; while they descend on the north into a succession of elevated valleys. The snowy peaks have been fixed in latitude, longitude, and altitude by the indisputable authority of the Trigonometrical Survey of India; and many of their names, with the observations that define them, are given in the accompanying table.

This remarkable range, including the highest summit known to geographers (Mount Everest), was described and drawn as a distinct chain, in my maps and Memoir on the Mountains of India in 1870; and it was then named the Southern Chain of the Himalaya. The method was adopted by Mr. Markham, the Chief of the Geographical Department of the India Office, and Honorary Secretary of the Royal Geographical Society, and also by the Heads of the Surveying Departments in India, as well as by the best professional geographers. Recently, however, the *Calcutta Review* has denied the existence of this chain, and has also advocated other opinions on the Himalayan System, which are equally inadmissible. Hence, the following brief examination of the whole subject in its general aspects has been undertaken.

To comprehend the Himalayan System, it should be considered in the first place in its relation to the structure of the Asiatic Continent, of which it is but a part. It will then be seen to be a segment of a vast girdle of mountains, which rises on three sides from the Indian, Pacific, and Arctic Oceans respectively, the circuit being completed on the fourth side from the plain of the Caspian. Thus—(1) The Himalayan portion of the girdle is that which ascends from India and the Indian Ocean. (2) From the Pacific and the rolling plains of China, rise in unbroken continuity with the Himalayan portion, those rugged mountains, the culminating ranges of which may take a general name from the Yunling, which stretches south of the Hwang Ho River, and from the Inshan, between the Hwang Ho and the Amur. (3) From the Arctic Ocean and the Siberian plains, the rising ground attains its highest summits in the Yablonoi Mountains which meet the Inshan Mountains at the Amur; and in the Altai-Saiansk Mountains, which is a general expression for the continuation of the Yablonoi westward, from the Selenga River to the Irtish. (4) South of the Irtish, the mountains face towards the west, and rise from the Kirghis and Turkoman Steppes, the waters of which are absorbed by the inland basins of Balkash, Aral, and the Caspian. Here the great girdle is completed by the culminating series, which, beginning with the Ala-tau and ending with the Pamir, connect the Siberian System with the Himalayan.

The culminating belt thus defined forms the proper limits of Central Asia, although it is too common to find countries on the very western verge of the continent wrongly included under that name. Politically, the whole of this Central Region was, and nearly all is still, under the dominion of China. Physically, it may be described as consisting of three elevated plateaus, and an intermediate depression. Of this series, the plateau of Tibet is the highest; the plateau of Kokonor is lower; and the plateau of Mongolia, generally, still lower. The depression, which is deepest at Lake Lob, and is the lowest part of Central Asia, lies to the westward of Kokonor, and between Mongolia and Tibet.

The Southern or Tibetan Plateau is bounded and upheld between the Himalaya on the south and the Kuenlun Mountains on the north. It has the Pamir on the west, and the Yunling and Bayan Kara Mountains on the east. The elevation of its plains is most remarkable, as they exceed at its western extremity 17,000 feet. Its valleys are between 14,000 and 10,000 feet. Its peaks include the highest in the world. Its breadth expands to about 600 miles in its widest part, in the meridian of 90° E. Gr. Its greatest length may be reckoned at 1500 miles. While giving rise to such rivers as the Indus, Brahmaputra, and Yangtsi, it is largely drained into inland lakes. Its whole mass forms the principal subject of this discourse, and will be dealt with more in detail hereafter.

The Middle or Kokonor Plateau occupies an elevated tract, intermediate in position and altitude, between the eastern parts of Mongolia and Tibet. The lake which gives its name to this plateau is 10,500 feet above the sea; and this altitude appears to include the country drained by the Upper Hwang Ho as well as the lake district. The latter, according to Prejevalsky's last researches, maintains this elevation nearly up to Lake Lob. Some of the peaks rise to 14,000 feet. This plateau may thus be considered to occupy a trilateral space enclosed by the Bayan-kara and Yunling Mountains, on the south-west and south-east; and by ranges on the north which connect the Kuenlun and the Inshan Mountains, while they divide Kokonor from the lower Mongolian plain. The Hwang Ho is crossed by the great wall of China, at the foot of its descent from the plateau; where the continuous ranges of the Yunling and Inshan Mountains approach and terminate on or towards its banks.

The Northern or Mongolian Plateau, including the Chinese Governments of Inner and Outer Mongolia and Ili, is buttressed by the Altai-Saiansk and Yablonoi ranges on the north; by the Inshan Mountains on the east; and by the Thian Shan and Kokonor Mountains on the south. Like the other plateaus, the Mongolian also gives rise to important rivers, viz., the Irtish, the Yenisei, and the Amur, while it is also partly drained into inland lakes. The lakes and rivers are almost wholly confined to the

northern and western parts of the plateau, where the surface is most mountainous. The southern and eastern parts form the great plain of the Gobi or Shamo Desert, which is almost waterless. This plateau has none of the excessive proportions of the Tibetan highland, except in regard to extent, which is larger. Its elevation may be reckoned from 12,000 to 3000 feet, and its greatest heights occur on the western summits. The eastern part indeed is of trifling elevation, except in comparison with the low maritime plains from which it rises.

Between the Thian Shan Mountains on the north, the Kuenlun Mountains on the south, the Pamir on the west, and Kokonor on the east, is a depressed plain which slopes from about 4000 feet above the sea at the foot of the mountains, to 2000 feet in its lowest part, at Lake Lob. According to Zimmerman the altitude of Lake Lob is only 1280 feet. The mountains themselves attain to heights of 20,000 to 25,000 feet. The margin of this depressed plain is occupied by many towns, beginning with Khotan at the foot of the Kuenlun, and including Yarkand, Kashgar, and many others as far as Hami, which ends the urban circuit, at the eastern extremity of the Thian Shan Mountains. In the midst of the plain is the western extremity of the Gobi Desert, which extends eastward through Mongolia. The nature of the transition from the low swamps of Lake Lob to the higher part of the Gobi, where the caravans pass between Hami and the Kiayu gate in the Chinese Wall, is unknown. But it may be inferred from Prejevalsky's last journey that the depression is terminated by mountains on this side, as elsewhere.

In bringing to a conclusion this general and introductory view of the encircling structure to which the Himalayan System belongs, it is desirable to allude very briefly to the rest of the Asiatic Mountains, as they may all be regarded as offsets from the exterior of the great girdle. These offsets emboss the maritime slopes of the continent, and stretch out to its extremities. (1) From the Tibeto-Himalayan System, proceed all the ranges or spurs that cover China and the South Eastern Promontory. (2) The highlands of India, south of the Ganges, at one time probably filled the intervening valley and were continuous with the Himalaya. (3) The Hindu Kush System with its prolongations, slopes, and expansions, also emanates partly from Himalaya and partly from Pamir, a division which will require some discrimination in the further examination of the Himalaya. To that attractive subject we have so far endeavoured to prepare the way, which we will now attempt to pursue.

II.

Let a geographer be supposed to be entering upon the study of the Himalaya Mountains, in his closet, or a traveller to be about to explore them from the plains of India, the most prominent feature that will appeal to the notice of either is the great range of snowy peaks, stretched out in a continuous line above the plains of India, from one end to the other, for about eighteen hundred miles.

One would at this time naturally expect student and traveller alike to come to the conclusion that these peaks form the culminating summits of the slopes that have their base in the great Indian plain. But in earlier days, when Himalayan surveying was only beginning, it was not so easy to reduce the mighty maze or labyrinth of mountains to an intelligible plan. Mr. Markham has already written the history of Himalayan geography, and explained the part taken by successive contributors. Its history presents a remarkable example of the enduring influence of an authority, when once it has become recognised, in the case of Captain Herbert's attempt, for the first time, to elucidate Himalayan structure, in 1818. He had only a very limited knowledge of the subject, and adopted an erroneous principle. The Trigonometrical Survey of India had not then fixed the position and altitude of the peaks, nor surveyed the mountains from the plains of the Punjab to the plains of Khotan. The Himalayan Missions and Native Explorers had not then crossed the mountains at various parts, defining positions and altitudes with scientific accuracy. If Herbert's original mind had possessed these advantages, it is probable that he would have made excellent use of them, and have escaped the mistaken principle which a narrow induction and a false definition led him to adopt. He unfortunately assumed that a succession of peaks in the same direction did not constitute a chain, if rivers rising on one side passed between the peaks to find their outfall on the other. His heretical definition has been recently repeated with less excuse by the *Calcutta Review*, which, in an elaborate argument, contends that "the essence of a chain is the continuous and close connection of its links," and denies that a succession of peaks in the same direction forms a chain, if rivers run between them.

The answer to the question, "What is a chain?" must be taken from that general acceptance of the meaning of the word which is declared by dictionaries; and no individual writer is entitled to set up an interpretation contradicting such authority. It is surprising that a literary periodical of the high standing that may be justly attributed to the *Calcutta Review* should have to be taught this elementary canon of criticism. On the part of the editor, it must be an oversight; on the part of the reviewer himself, it is too manifest that he has been blinded by a disposition to oppose every effort for the development of Trans-Himalayan trade; that in this spirit he has taken Mr. Markham's book as a medium of attack, adopting Herbert's fallacy, and exposing every supposed mistake in the book that the keenest scrutiny could discover, to throw discredit on Mr. Markham's advocacy. With what success those can fairly judge who have read the answers to the review in this magazine.

It may be anticipated from these remarks that the dictionaries do not confirm the definition of a chain given by Captain Herbert and the reviewer. A chain is not only "a series of links or rings passing through one another";—but also, "*a number of things coming after each other.*"* For example,—a chain of events, a chain of pools, a chain of islands, a chain of mountain peaks. These are common expressions which everybody understands. It would be more to the purpose to deny to the chain of peaks to which the reviewer objects any features whatever that warrant their destinction as a separate chain. But he contents himself with a single objection, viz., that being

* See Chambers' *Etymological Dictionary*.

occasionally intersected by rivers they are not therefore a chain. We shall endeavour to prove that they are.

We have already alluded to the Himalaya as upholding the plateau of Tibet. In a general way the mountains may be said to rise from the plains of India, but in fact they are often separated from the plains by low hills called the Sewalik, except between the Jhelum and the Indus, where the hills expand into a low plateau, fringed at the edge of the plains by the Salt Range.

The culminating summits of the southern slope of the Himalaya, is formed by the chain of peaks to which the *Calcutta Review* objects, but which we insist on calling the Southern Chain of the Himalaya. There can be no question either about the culminating quality of the peaks, or their sequence in the same line. One is determined by observations for altitude, and the other by observations for latitude and longitude; and as both are vouched for by the Trigonometrical Survey of India, there is no more room for disputing them than for disputing the dictionaries from which our definition of a chain is taken. To make the matter quite clear, a tabulated list of the peaks in question with their co-ordinates of position and altitude is attached. The accompanying map is based on such observations, and generally illustrates the paper.

The Southern Chain descends on the north and finds its base there in a succession of valleys, which divide it from another range of mountains termed the Northern Range.* The reviewer asserts that the peaks of our Southern Chain belong to spurs extended from the Northern. But it will be made clear that the separation between the two ranges is effected by valleys of such length and depth, as to make it untrue and unreasonable to say that these valleys are crossed repeatedly by spurs connecting the peaks on their opposite sides; especially remembering that rapid rivers run along these valleys, and afford a convincing proof that no obstacle of the kind interrupts the flowing streams. Some of these valleys are upwards of a hundred and two hundred miles in length, and from 10,000 to 15,000 feet lower than the parallel ranges and chains of peaks which they so effectually divide.

The valleys which separate the Northern and Southern Chains are generally among the most remarkable and best known in the Himalaya. They include the valleys of—Kashmir, watered by the Jhelum; the Chandra-Bagha, above Kishtwar; the Spiti and Baspa, affluents of the Sutlej; the uppermost valleys of the Bhagirati and Alaknanda, headwaters of the Ganges; the uppermost valleys of the Kali, Karnali, and of some affluents of the Gandak; the Palgu Lake and the Kuti Valley, with the broad plain of Dingri, and the Chomto Dong Lake, all in or adjoining the Kosi basin; Turner's lakes, and the Painom which joins the Sanpu; and finally, the Nichu, Lopra Cachu, and Omchu, which join the Brahmaputra in Assam.

As an example of the way in which the Southern Range is divided from the Northern, take that part of the Southern Chain which includes the great peaks of Dayabung (26,305 feet), Mount Everest (29,002 feet), and Kanchinjinga (28,156 feet). (1) Between Dayabung and the Northern Chain is the Palgu Lake. (2) Between Mount Everest and a very high peak in the Northern Chain is the Dingri Plain, 13,860 feet above the sea, or about 15,000 feet *below* Mount Everest, and so broad and flat that several regiments of cavalry might be manœuvred on it. (3) Between Kanchinjinga in the Southern, and Lagulung Pass in the Northern Range is the Chomto Dong Lake, 14,700 feet above the sea, or only half of the height of the southern peak. Similar examples are found in the Kashmir and Chandra-Bagha Valleys; indeed, throughout the vast extent of these parallel chains, there is nothing to interfere with the separation between the two chains; nothing to warrant the treatment of peaks like Everest as if they belonged to spurs from another range of a superior rank.

In connection with the Southern Chain, there are two classes of rivers that serve to mark its character as a range, almost as well as the continuity of its lofty summits. (1) The first includes the rivers already named, which rise on its northern slope and flow along it for considerable distances, before they pass through fissures in the chain, to descend down to the plains. (2) The second class consists of rivers that have their sources solely along the southern flanks of the range, and thus give it the character of a partial water-parting; which, indeed, is all that can be attributed to the Northern Chain, as we shall show presently.

Among these secondary rivers are the Ravi and the Beas, of the Punjab; the famous Jumna; the Ramgunga and the Kosila, of Kumaon; some affluents of the Gogra; several tributaries of the Gandak; the Bhagmati, of Khatmandu; all the affluents of the Kosi, south of Mount Everest, except the Butia, including the Indrawati, San Kosi, Dudh Kosi, and Tambur; the Tista, of Sikkim; the Ammochu; the Machu and Pachu; the Mattesam; and all the affluents of Monas, except the Lopra Cachu.

How shall we find a general designation for the common origin of all these rivers, if we are denied the existence of the Southern Range? Certainly, they have nothing to do with the Northern Range.

We conclude, then, in favour of the Southern Chain:—(1) As the culminating summit of the Southern or Indian slope; (2) As the common origin of a succession of rivers; (3) As cut off from the Northern Range by a succession of remarkable valleys, sometimes very long, sometimes very deep, and sometimes very broad and flat, and all containing considerable rivers, running parallel to the chains which they divide.

Further attention may now be paid to the Northern Chain. It rises on the south from the beds of the streams which have been already described as dividing it from the Southern Chain; and it separates those streams from the parallel courses of the Upper Indus, Sutlej, and Sanpu, which in succession define its northern base. No heights equal to Mount Everest, or Kanchinjinga, have yet been found in it; but only the western part is well known and surveyed. There a few heights exceed 25,000 feet, and there are many above 20,000 feet. Glaciers are more abundant than in the Southern Chain.

From the boundary of Kumaon and Nipal eastward, or between the meridians of 81° and 95°, the

* This Northern Chain is Mr. Markham's Central Chain, and the reviewer's Southern Watershed.

Northern Chain has only been barely made known to geographers at eight points along the whole distance of a thousand miles. These occur (1) at the source of the Karnali, between Western Nipal and the Upper Sutlej; (2) at Muktinath, and (3) at Somnath, or No Pass, both between Central Nipal and the Sanpu; (5) at Dango Pass, and (6) at Lagulung Pass, both between Shigatze, in Tibet, and the Arun, in Eastern Nipal; (7) between Gianzejong and Gangamar, on the River Painom, on the route between Western Butan and Lhasa; (8) on the Towang route between Lhasa and Assam.

With the Trigonometrical Survey on the west, and these explorer's reconnoisances on the east, the summit of the Northern Range can be traced with some distinctness, while its northern base is unmistakably defined by the prolonged courses of the great rivers flowing through the same trough, although in opposite directions. The Upper Indus and Sanpu are of such lengths and magnitudes that no one has suggested such an amalgamation of the mountains on either side of them as the *Calcutta Review* advocates between our Northern and Southern Ranges. Not even the reviewer imagines spurs extending across the prolonged trough of the Upper Indus and Sanpu.

But the reviewer, following Mr. Markham, agrees with him in considering the mountains on both sides of the trough as Himalaya. In my original discussion of this subject, the Himalaya is limited between the south side of the trough and the plains of India. With the best disposition to concur in the newer view, my own method seems to me to be the more symmetrical and convenient, more consistent with the nature of rivers and mountains. For the present purpose a river may be likened to a geometrical line, having only the one dimension of length, but neither breadth nor depth. It can be conceived to be absent altogether, without disturbing the form of its channel, or any other feature of the ground. The dry channel, or a line along the bottom of the valley, would equally serve our present purpose.

The result is very different if the summit of a mountain be taken as the line of separation between one orographic system and another. A mountain is not a line like a river, which can be separated from the rest of the ground without disturbing its form. The mountains on the north of the Sanpu are the contreforts, buttresses, slopes, or escarpments of the table-land which they support; and they cannot be cut off from it. If a drawing or model be made of that table-land, you cannot terminate it on the south at the top of its own slope, and say that the table-land is Tibetan, and the slope is Himalayan.

The whole mass, with all its slopes, forms the Tibetan Plateau, just as the whole mass, with all its slopes, from base to base, between the Upper Indus and the plains of India, forms the Himalaya. It might fairly be discussed, whether the term "Himalaya" should extend beyond my Southern Chain; and whether the Tibetan Plateau should not be limited by the rivers that form the northern base of that chain. Such a definition would be more consistent with the political limits of Tibet, and the extension of the natural features that distinguish the whole table-land from the outer slopes of the Southern Chain. It may also be argued that the earlier use of the name was confined to the snowy peaks of the Southern Chain, when all beyond was unknown. I conclude that the extent and simplicity of the line of the great rivers, as well as the symmetry and compactness of the mass which they help to define, is in favour of my original method. Both this question and the one relating to the Southern Chain involve geographical principles, and to be fully discussed they deserve to be illustrated by apposite examples, drawn from various parts of the globe. But such a treatment is inadmissible within the present limits. I conclude the discussion of this point by reminding the reader that my Northern Chain is Mr. Markham's Central, and the reviewer's Southern.

It may have been observed that no attempt has yet been made to deal with the eastern and western limits and extensions of the chains, which have been reached on our progress northward. The fact is, that the fundamental elements of this part of the great Asiatic girdle are to be found on the path of the central section, which we have been pursuing. Thus far a Southern Chain has been established, and the succeeding one has been defined as the Northern Chain of the Himalaya, contrary to the views of others. The next range rising from the beds of the Upper Indus, Sutlej, and Sanpu rivers, belongs to another system, which we call the Tibetan.

The Tibetan Plateau, as distinguished from the Himalayan, extends from the Upper Indus and Sanpu, on the south, to the depressed plains of the Gobi, on the north; and between those limits it has a breadth, in the widest part, of about 500 miles. Like the Himalayan Plateau, it is bounded by two chains of mountains, which, descending to the plains on the north, and the rivers on the south, are divided by the greatest breadth of the plateau, on the east, where the elevated lake basin is spread out, while on the west the bounding ranges are only separated by the upper valleys of the streams which water the plains between Khotan and Yarkand.

The Southern Chain of this part of the system is called the Gang-ri, or Gang-dis-ri, so far as it separates the Sanpu and Indus basins from the elevated lake basin of the Tibetan Plateau. To the westward this elevated lake basin is succeeded by the basin of the low-lying lake Lob, and the mountain range which divides the Lob basin from the Indus basin, although a continuation of the Gangri Mountains, is conveniently distinguished as the Karakoram Range.

In the Karakoram Mountains the geographer has again to contend with the limited conceptions of the observer on the spot. Because the summit of the Karakoram is in part flattened, Mr. Shaw denies that it is a range. He would thus deprive us of a general term, denominating a lofty water-parting between two distinct drainage basins, which is also marked by numerous peaks, though here and there presenting smoother summits.

But if any mountains be entitled to the name of a range it is the Karakoram, for the following reasons:—(1) Its culminating summit attains a height of 28,278 feet in the peak labelled K 2, and otherwise unnamed by the Trigonometrical Survey. This peak is next in height to Mount Everest. We have repeatedly urged that it should be named after Sir George Everest's successor, Sir Andrew Waugh; and if Mount Waugh be not sufficiently euphonious, let it be called Mount Andrew. It has many other peaks

exceeding 20,000 feet, and its principal pass is 18,000 feet above the sea. It is, therefore, not wanting in height. (2) It forms an unbroken water-parting between the important drainage basins of Lake Lob and the Indus, and in that respect is more perfect than the Himalaya. (3) Its length exceeds 300 miles; and whether we regard its height, its length, its water-parting, its passes, its bold and massive character, its extraordinary glaciers, or its deep gorges, it is certainly one of the most remarkable ranges in the world. The lamented traveller, J. W. Hayward, argues with us in defence of the name and extent of a Karakoram range.*

If we may be allowed to compare great things with small, a parallel may be found in a range of roofs running along the side of a street. Because some of the roofs are ridged, and others are flat, while some have tall steeples, is this variation of the form of the continuous housetops to prevent them from being regarded as the range? We think not.

The same author has also committed himself to the opinion that the Pamir (or the mass between the Gobi and Aralo-Caspian plains) is, instead of a meridional range, a series of latitudinal ribs or ridges running east and west.† But these ribs or ridges are, in fact, only the spurs descending from the flanks of the meridional ranges, the direction of which is defined (1) by their bases in the plains; (2) by the continuity of the chain of peaks which mark the summit of the ranges; (3) by the water-parting between the Tarim and Aralo-Caspian basins.

In thus correcting an able traveller, it may be well to add, that the local observation of a great phenomenon is apt to be mistaken by the effect of a vast object on limited vision, the function of which object is to be properly estimated, not so much by its apparent as by its relative conditions.

A large part of the Karakoram has been delineated by the Trigonometrical Surveyors, but there is a portion of its western extremity that remains unexplored. It lies between the Mustagh Pass, the Neza Tash, and Karambar Pass; and its southern edge is defined by a range of peaks fixed in position and altitude. It is said to be traversed by four passes named Kalik, Mintaka, Gundarab and Karachankar; and these are supposed to cross a range distinct or superior to the fixed peaks. The probability is that the peaks form the edge of a plateau, the northward side of which has not been defined.

The Gangri Range is only known at its extremities. It has been crossed in several places between the Ling-tzi Plain and the Manasarowar Lake. But from thence to its eastern termination, where it meets the mountains that divide the elevated lake basin from the basins which succeed that of the Sanpu, it has been crossed, in two places only, by the scientific observer, employed in Himalayan exploration. The missionaries Huc and Gabet also crossed the range and describe its difficulties. They name it the Tant-La. Of the passes crossed by the explorers, one is the Khalamba Pass, mentioned by the Calcutta reviewer, in a part of the range which bears the local name of Nyen-chen-tang-la. The other is the Dam Lhargan Pass, and the two lie between the Tengri Lake and the Sanpu. Several altitudes of the Gangri have been observed above 20,000 feet; as the Aling Gangri, 23,000 feet; the Nyen-chen-tang-la, 23,600.

Parallel with the Gangri Range, but at a distance generally of 70 miles, the plateau itself has been recently explored along a route between the Pangong Lakes and Lhasa. It has also been crossed at its western end, between Manasarowar Lake and Khotan, and between Khotan and Changchinmo. The altitude of this immense plain is 16,000 feet above the sea at Thaldat, in the west, on the Changchinmo route, and 15,190 feet on the surface of the Tengri Lake, in the east of the plain. We reserve the consideration of its extensions on the east and west, according to the design already mentioned, and proceed to notice the range which forms the northern boundary.

The Kuenlun Mountains are believed to extend continuously between the Tibetan Plateau and the Gobi Desert. They are known to do so at the western extremity of the plateau, and as far east as 81° 30′, where the Kuenlun Mountains form the culminating summits of the slope upwards from the plain about Khotan. The lofty range which divides the eastern part of the Tibetan Plateau from the lower steppe of Kokonor, was crossed by Abbé Huc, in 1846, and also by Captain Prejevalsky, in 1871, and this range is said to be a continuation of Kuenlun by various authorities. Indeed, when one considers the great altitude of the Tibetan Plateau, it is easier to conceive its descent to the Gobi by the steep slopes of a mountain range, than by a gentler decline. The termination of the plateau, on the north, by a mountain range similar to the Himalaya, which terminates it on the south, appears to be more probable than any other theory. When the reviewer states that no peaks could be seen by the Pundit to the northward of Tengri Lake, he might have added that the Kuenlun is about 400 miles distant, and as the lake is 15,190 feet above the sea, an addition of 5000 only would make the Kuenlun exceed 20,000 feet, a height which it often attains further west. If Colonel Walker, as the reviewer remarks, is judiciously silent on the subject, it is easily explained, because his map ends near Khotan, with the limit of the surveys. What other ground the reviewer has for a doubt, insinuating denial, we know not.

In defence of the Lama survey of Tibet, against the reviewer's remarks, it is fair to state (1) that their delineation of the Sanpu, as well as the general accuracy of its confluents, and of the towns on its banks, has been confirmed by the Pundit's observations; (2) that the same authority establishes their form of Lake Palti, in preference to Mr. Bryan Hodgson's; (3) their position of Tengri Lake is essentially confirmed; (4) the last route of the Pundit, by Towang, coincides with places on the Lamas' map. No doubt we could point to inaccuracies, but we leave others to find fault with such an original work, and gladly express our gratitude for essential parts of it, which have stood the test of the latest research.

The leading features of the Great Southern Plateau having now been traced from India to the plains of Gobi, it will be remembered that they consist: (1) of the snowy range of peaks, that have been triangulated from the plains of India, and form the Southern Chain of the Himalaya; (2) of an inner or Northern

* *Royal Geographical Society's Journal*, xl., p. 66.
† *Ibid*, xlvi., p. 266.

Chain separated by deep valleys, running waters or broad plains from the Southern Chain, and having their northern base distinctly defined by the courses of the Upper Indus, Sutlej, and Sanpu, through a continuous trough, with a length of about 1400 miles; (3) of a third chain, formed by the Gangri and Karakoram Mountains, rising from the Upper Indus and Sanpu, and dividing the basins of those rivers from the elevated lake plateau of Tibet, and the depressed lake basin of Lob; (4) of the broad and elevated lake plateau of Tibet, and its prolongation westward into the upper valleys of the Lob basin; (5) of the Kuenlun Mountains which have their northern base in the Plain of Gobi, and divide it from the elevated plateau of Tibet. The meridional section on the accompanying map will help the mind to realize the conditions of the mass and the relative position of its great features. We may here also refer to the accompanying fac-simile of the original map which appeared with Mr. Bryan Hodgson's paper on the Physical Geography of the Himalaya, dated 1846, and printed in 1857. It is an illustration of the system advocated by Captain Herbert, Mr. Bryan Hodgson, and the *Calcutta Review*. Its scale is the same as that of the other map, and thus the comparison of the two is facilitated as much as possible.

III.

Himalayan geography, so far as we have hitherto proceeded, is a matter of comparative simplicity, and based on grounds that can be defined, to a great extent, with precision; but when we endeavour to trace the connection of the Himalayan System with those that belong to the Pacific slopes, on the east, and to the Caspian slopes, on the west, the difficulties decidedly increase.

In both directions we have to advance only to a small extent, on knowledge that is complete and certain, and to a much greater extent on information that is neither complete nor well ascertained. Still we shall aim, notwithstanding the *Calcutta Review*, at giving distinctness to the conceptions which are to be derived from this mixed material. We see no necessity to delineate every river course with dots, because it requires confirmation; or to break the continuity of mountains, because their delineation rests on uncertain data, if on anything better than hypothesis. In works of the kind in question some dependence must be placed on the intelligence of the public. They are not totally ignorant who take an interest in these advanced subjects, and we need not treat them like babies. Our reviewer has picked up a few practical notions, but his experience does not qualify him to use them judiciously.

There is no greater stumbling block, no more invincible obstacle, to geographical progress, than chaotic or confused notions. Let us only see some meaning in the work, and we may then proceed to enquire whether it is right or wrong. Mountains blurred over the face of a map, however well executed, would be better omitted. In the present case we hope that a series of geographical enquiries, involving widely-spread scientific observations, that may either confirm, modify, or contradict our suggestions, will be an early consequence of the following attempt to trace our Himalayan System eastward and westward, and to ascertain its equivalents in the Pacific and Caspian sections.

It has been demonstrated by undeniable observations that the slope of the Himalaya upwards from the plains of India, culminates in the range of snowy peaks called the Southern Himalaya. This range is traced without difficulty as far as the gorges by which the Indus and Sanpu undoubtedly cut through the Northern and Southern Chains on their descent to the plain, although it seems like a national reproach to confess that neither of these great Indian rivers has yet been explored along these intersecting gorges. The Sutlej, which is known throughout, makes a precisely similar descent, and the character of the unknown gorges may be inferred from it.

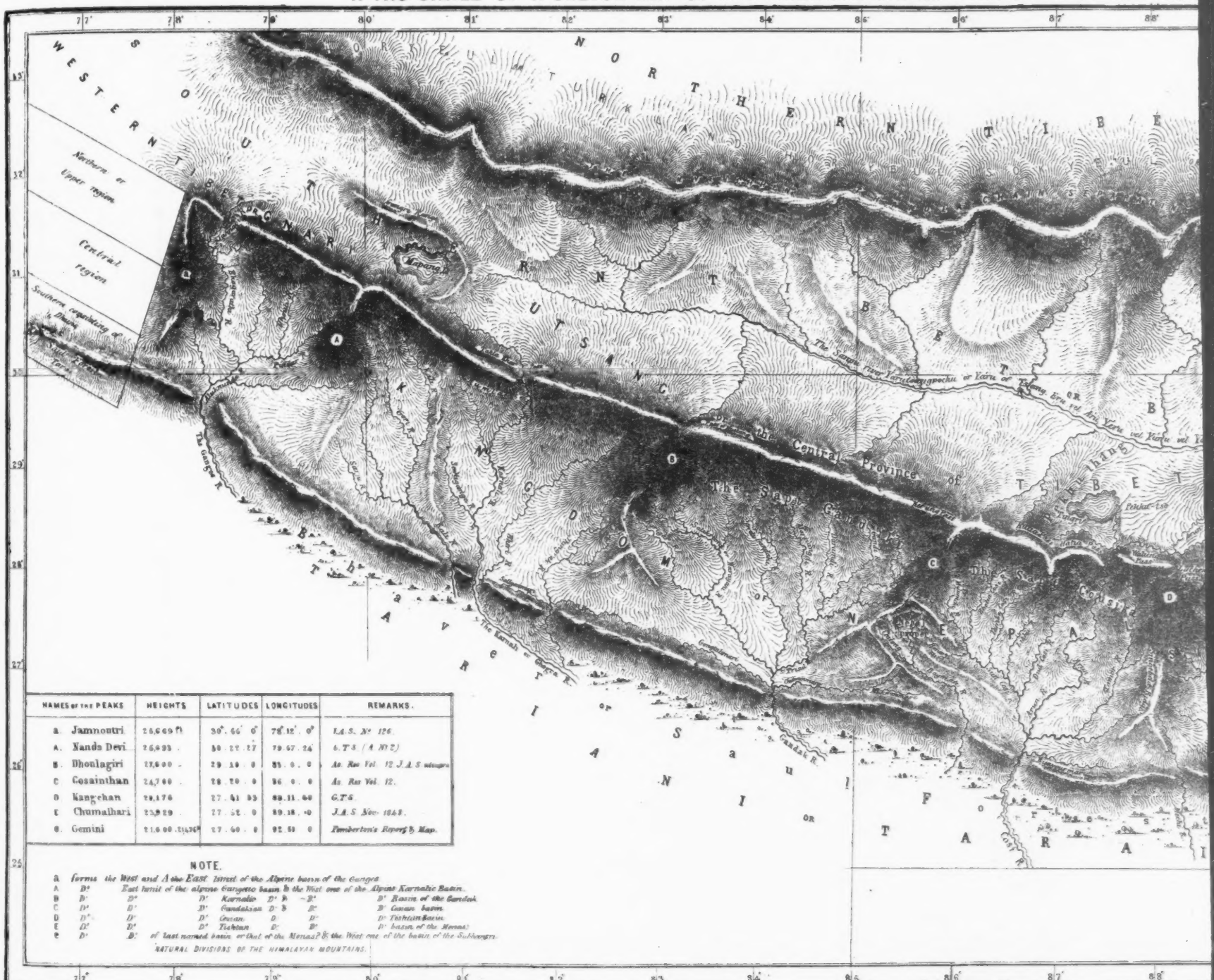
The Sutlej is 10,597 feet above the sea where it enters the Northern Chain at Shipki, and 1100 feet where it leaves the base of the Southern Chain at Ropur. The Indus is only 4500 feet at Acho, where it enters the gorge; it is 891 feet at Attock, where it receives the Kabul River, and 700 feet at Kalabagh, where it reaches the plain at the foot of the Sait Range. The Upper Sanpu has not been seen below 11,350 feet at Dhomda, till it enters the Plain of Assam.

On passing beyond the Indus and Sanpu, the set of the ground in both cases undergoes a change. The western side being the better known, we proceed to discuss it first.

The summit of the Southern Chain is defined to the westward of Kashmir by the line of peaks which rises from the right bank of the Jhelum between Kashmir and Mozufferabad, and is continued from thence to the Indus between Palus and Thakot, at a height of 14,300 feet. Proceeding from the same point to the west of the Indus, we take as our clue to the continuation of the Southern Range, in the present defective state of our information, those observed peaks which extend from the Indus to the Chitral or Kunar River at the height of 14,800 to 17,000 feet. The base of the range is in the Plain of Peshawar, which having the same altitude at the foot of the mountains, as that which occurs all along the Southern Range, that is, about 1000 feet, may be considered as an outlier of the Indian Plain. Similar altitudes are found in a continuous line rising from the western or right bank of the Chitral or Kunar River, from Asmar to its confluence with the Kabul River at Jalalabad; and the same range is prolonged in a great curve from the Kabul River, up to the Hindu Kush at Khawk Pass, its base being defined by the affluent of the Kabul River, which descends from the elevated Panjshir Valley. The altitudes of that part of the range, which runs parallel with the Kabul River, culminate in 15,337 feet.

The range thus defined is of no mean importance. Its physical features are so difficult of access as to make it a political barrier against Afghan domination. Indeed, the mountains enclosed by the Panjshir on the west, the Chitral River on the east, the Hindu Kush on the north, between the Khawk and Dora Passes, and the Kabul River on the south, occupied by the Siahposh Tribes, or Kafirs, have proved an impregnable defence against all the surrounding Mahommedanism, enabling the ancient faith and independence of these highlanders to be maintained to this day. The other states, more or less independent, include the Mohmand Hills,

A FAC SIMILE OF "A SKETCH MAP OF THE PRINCIPAL NATURAL DIVISIONS OF THE HIMA



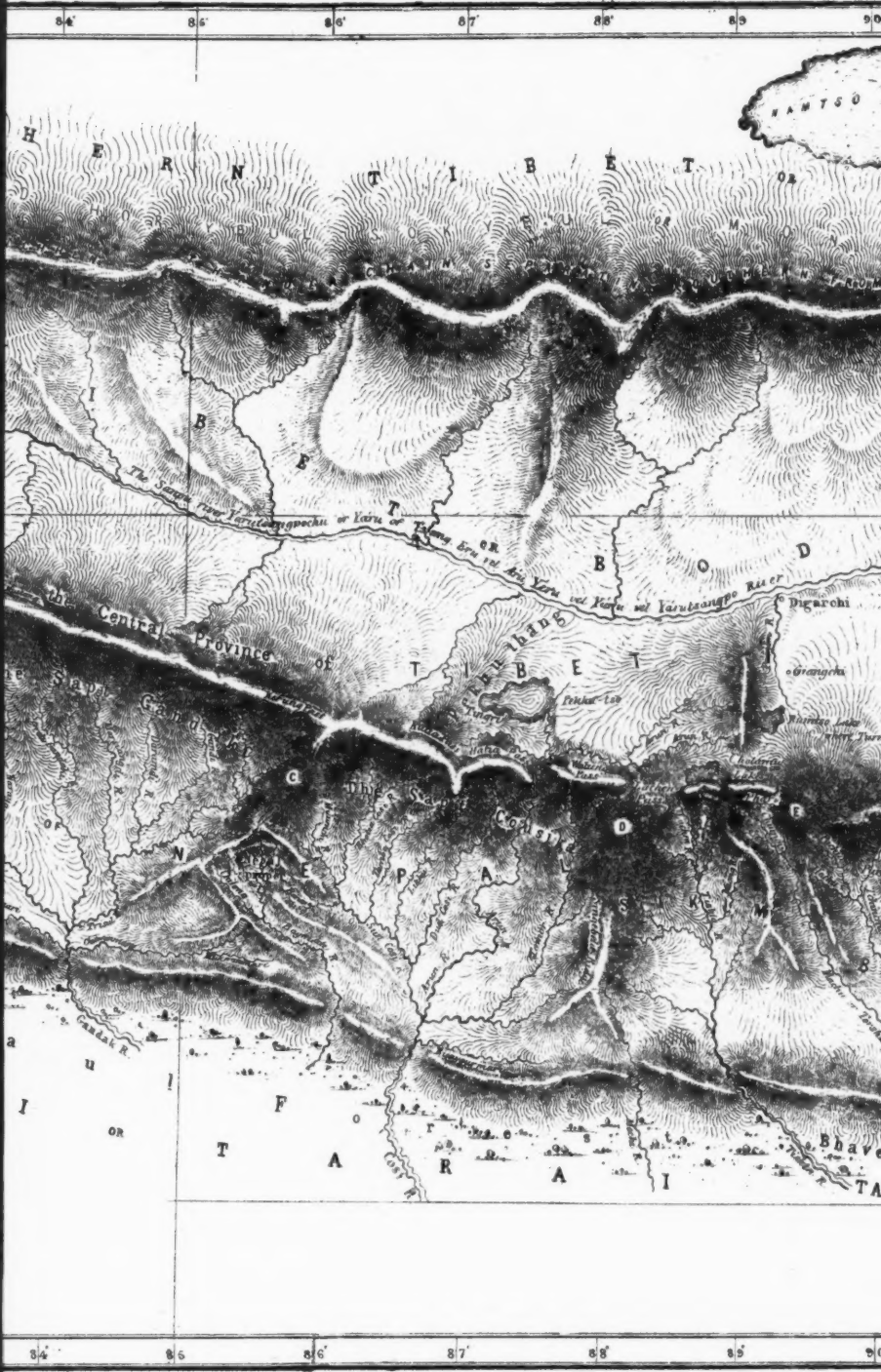
NAMES of the PEAKS	HEIGHTS	LATITUDES	LONGITUDES	REMARKS.
a. Jamnoutri	25,669 ft	30°. 66'. 6"	78°.12'. 0"	I.A.S. N° 126.
A. Nanda Devi	25,895 .	30 . 22 . 27	79 . 57 . 24	G.T.S. (A. N° 2)
B. Dhonlagiri	27,600 .	29 . 10 . 0	83 . 0 . 0	As. Res Vol. 12 J.A.S. xxxxxx
C. Gosainthan	24,760 .	28 . 20 . 0	86 . 0 . 0	As. Res Vol. 12.
D. Kangchan	28,176	27 . 41 . 33	88.11 . 60	G.T.S.
E. Chumalhari	23,929 .	27 . 52 . 0	89.18 . 40	J.A.S. Nov. 1843.
e. Gemini	21.600 . 21,476	27 . 60 . 0	92 . 33 . 0	Pemberton's Report & Map.

NOTE.

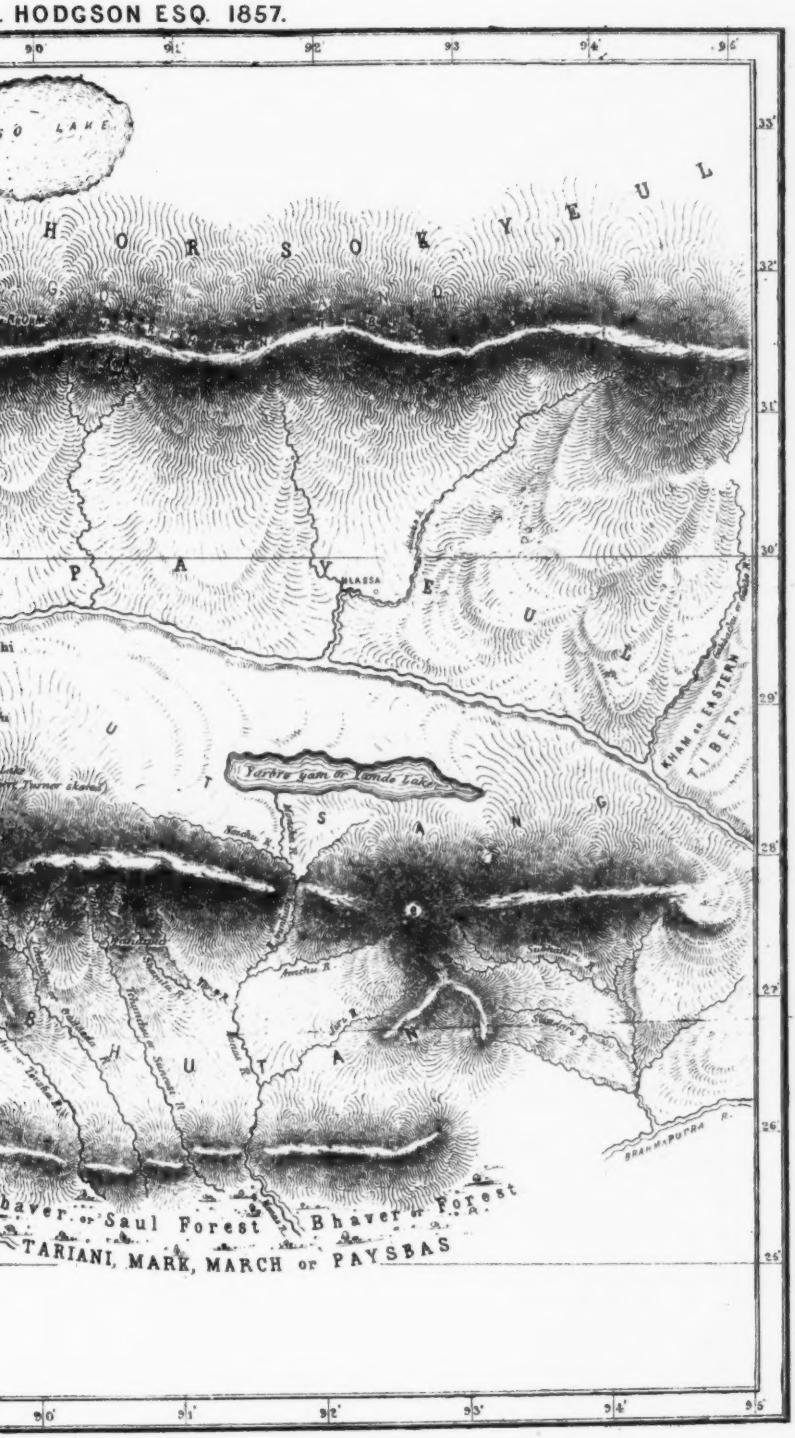
a forms the West and A the East limit of the Alpine basin of the Ganges.
A D' East limit of the alpine Gangetic basin. b the West one of the Alpine Karnatic Basin.
B D' D" D' Karnatic D' b D" D' Basin of the Gandak.
C D' D' D' Gandakian D' B D' Gosain basin.
D D' D' D' Gosain. D' D' D' Tishtian Basin.
E D' D' D' Tishtian D' D' D' basin of the Menas?
e D' D' of last named basin, or that of the Menas? & the West one of the basin of the Sukkeegra.

NATURAL DIVISIONS OF THE HIMALAYAN MOUNTAINS.

THE PRINCIPAL NATURAL DIVISIONS OF THE HIMALAYA" BY B. H. HO


84°
85°
86°
87°
88°
89°
90°
HERN TIBET OR
The Sanpu river Yarulsangpochu or Yaru or Tsang Bru or Ava Yaru or Kiaru or Yarutsangpo River
BOD
Digarchi
The Central Province of TIBET
Tsangpo
Tsangpo or Yaru Tsangpo
Grangchu
Tsangpo
Tsangpo
Tsangpo

. HODGSON ESQ. 1857.



Chitral and Mastuj, Bajawar, Panjkora, Swat, Buner, and the tribes in the Indus Valley beyond the frontiers of Hazara and Kashmir. This is a question of so much importance that it will be noticed again in connection with the extension of the Mountain System to the north.

Before we proceed in that direction it is needful to observe that in connecting the Southern Range with the Khawk Pass of the Hindu Kush, a departure has been made from its proper course as the culminating summit of the slopes which have their base in the plains of India. The temptation to do so lies in the desire to point out the relation of the Southern Range to the independence of Kaffiristan and the rest of these Hill States.

In proposing to continue the Southern Range beyond the Kabul River, we must go back to the Plain of Peshawar, and connect it, by way of the Indus, with the great plains of India at Kalabagh, where the Indus debouches from the low hills of the Salt Range. Here it is obvious that the mountains which for 1800 miles skirted the northern and north-western edge of the plain, are now found extending almost at right angles to that direction. The culminating summit of their slope towards India is generally supposed to rise only to 11,300 feet in the Takht-i-Suleiman, or Throne of Solomon, which gives its name to the range. But there is a higher peak in the Mahsud Waziri country, rising to 11,580 feet. Between 29° and 30° north latitude, the range makes a bend to the westward for about 150 miles, near the frontiers of the Punjab and Sind, as well as of the Affghan and Beluch territories. At the Bolan Pass the range resumes its meridional course, and takes the name of the Hala Mountains, till it terminates in the Arabian Sea, at Cape Monze.

Our task is now to trace the line connecting the Southern Range of the Himalaya with the Suleiman Mountains.

Regarding Peshawar as the pivot on which the rectangular change of the mountain-face takes place, we may note that while Peshawar is 1165 feet above the sea, the Valley of Jalalabad, which lies further up the Kabul River, is 1960 feet at Jalalabad, and 1400 feet at Lalpura. The famous Khyber Range, culminating in 5270 feet, divides the two valleys, except where the Kabul River connects them through a narrow gorge. The Khyber is merely a continuation of the hills which fringe the plain of Peshawar and form the foot of the mountains. Again, the Jalalabad Valley is succeeded, on the same stream, by another valley at a much higher level, exceeding 6000 feet, in which the city of Kabul is situated. The Jalalabad and Kabul Valleys are separated by the Karkacha Ridge, which is crossed by four passes, at heights rising to 8000 feet. The Karkacha Mountain is an offset from the Safed Koh Range, which has its northern base along the Kabul River, and culminates at an altitude of 15,622 feet. At the head of the Kabul River are the continuous Vales of Ghorband and Panjshir, rising to 9000 feet, and enclosed by the parallel ranges of the Hindu Kush on the one side, and of the Pagman and Siahposh Mountains on the other. Finally, the Safed Koh may be considered to be—either the commencement on the north, of the mountains which stretch southwards to the sea, and have the River Indus for their Indian base,—or as the connection between those mountains and the Himalaya. But we must refrain from entering further into their orography, and revert to the Himalaya.

One remark, however, we take this opportunity of adding. The Suleiman Range, like the Southern Range of the Himalaya, is not the water-parting of the Indus. That is represented by a parallel range to the westward, which in some parts is 120 miles distant from the Suleiman Mountains, and serves to divide the basins of the Helmund and Indus. This intermediate highland of the Lower Indus is very little known. It is occupied by independent tribes, which are no more subject to the dominion of the Amir of Kabul than they are to that of the Lieutenant-Governor of the Punjab, although their country is regarded as a part of Afghanistan. Certainly such a state of things is anomalous, and alike inconsistent with the peace of the British frontier, and the safe passage of trade to and from India. Further south, where the frontier divides Sind and Baluchistan, the water-parting separates the Indus from the basins of the Purali and Hubb Rivers. In that quarter recent political changes promise a better prospect of a settled border.

Before we proceed to trace the western extension of the Northern Chain of the Himalaya, and of the other interior chain which includes the Gangri and Karakoram Mountains, it is believed that the comprehension of the subject will be facilitated and advanced by taking up, previously, those other bounding chains which, like the Southern Himalaya, serve to limit and give precision to the area under discussion. These have their bases in the Gobi Plain on the east and the Aralo-Caspian Plain on the west; and if we select the town of Jhelum, in the plains of India, as a pivot or centre, then equal radii of 400 miles mark the distances from it, across the mountain mass, to the edge of the Gobi Plain on the north-east, and to the edge of the Aralo-Caspian Plain, near Kunduz, on the north-west, it is within this radius that our inquiries may be nearly confined; and we will begin with the Kuenlun Mountains.

The Kuenlun are best known where they rise from the Gobi Plain between Kiria, Khotan, and Yarkand. At those places the plain is successively 4570, 4490, and 3923 feet above the sea. The mountains rising from the plain between Kiria and Khotan attain to 23,887 feet, before they descend on the south to the broad and elevated lacustrine plateau, which is here 16,000 feet above the sea, and partly occupies the interval between the Kuenlun Mountains and the Karakoram Range. The interval is defined westward by the parallel course of the Upper Yarkand River, midway between the ranges.

In the absence of distinct observations for altitude, bearing on this question, we trace this part of the Kuenlun (1) to the summit of its descent to the plain along the right bank of the Yarkand River; (2) then we cross the river and take the end of the Khandar Range, near the Khandar Pass; (3) next we cross the unnamed river and gorge descending from Tashkurghan, and ascend to Tagharma Peak, 25,500 feet, where we are again on sure ground.

For the eastern extension of the Kuenlun, we refer to our previous statement, and have nothing to add. With regard to its extension westward, the direction

of the range makes a rectangular bend nearly where the Yarkand River enters the plain, and alters from a longitudinal to a meridional direction, which it retains to its northern extremity.

It has been already stated that the Gobi Plain has the Thian Shan Mountains rising from it on the north; and we have now to determine where those mountains are divided from the Kuenlun. Without dogmatizing when information is imperfect, it may be proposed to consider the slopes and summits west of Kashgar to be Kuenlun, and those north of the same city to be Thian Shan; the actual line of separation being fixed along one of the streams that descend to the plain at Kashgar. We should select for this purpose that stream which most distinctly marks the interval between the Narin basin and the Oxus basin, but information is not yet precise enough to make the selection.

In the present state of knowledge, we can only mention on this northern extension of the Kuenlun, one other peak besides the Tagharma. It has been called by Mr. Shaw, the Tash-balik Mount, and its height is 22,500 feet. There is no doubt, however, about the continuity and distinctiveness of this Kuenlun Range, as the culminating summit of the slope towards the Gobi Plain.

On the Aralo-Caspian side, the lowland plain extends eastwards along the Valley of the Amu or Oxus, beyond Kunduz, where it is only 500 feet above the ocean. The great plain is flanked on the south by a range of mountains which rise abruptly from it in a continuous wall, all the way from the Caspian to the head of the Lower Oxus Valley above Kunduz. This fringing range of 1000 miles in length, has only been distinctly delineated, where it forms the northern frontier of Khorassan, between the meridians of 55° and 62° east long., and rises to 7000 feet. See the Hon. G. Napier's map in the *Journal of the Royal Geographical Society*, vol. xlvi., in which the southern base of the range may be traced along the valleys of the Atrek and Mashhad. From Sarakhs to Balkh and Kunduz, the base of the range is equally well defined, and its abrupt slopes rise into mountainous summits, but there is no record of their height. General Ferrier describes the range south of Khulm, as a chain of high mountains rising almost to a peak, of great elevation. The altitudes observed between Kabul and the Oxus have only been taken along the routes, and relate to the passes and valleys but not to the summits and ranges. The rivers and valleys are also but little known. With this limited information, we can only fix the summit of the outer range at a few points. Fortunately, one of these points is at Lataband Pass, where the mountains terminate the plain, and divide the lowland from Badakshan.

Badakshan and the Lataband Range stand in a similar relation to the Caspian lowland, to that which the Vale of Kashmir and the South Chain of the Himalaya bear to the Plain of India. With Kunduz at 500 feet, the Lataband Pass is 4920, and the summits of its range probably rise from 6000 near the plain, to 15,000 at its junction with the Hindu Kush. The basin of the Kokcha, which includes Badakshan, is 3500 feet at Fyzabad, and lies between the Lataband and the snowy range of Khoja Mohamed. Pursuing the comparison of this Oxus section with that across the Himalaya, we find in the snowy range of Khoja Mohamed the counterpart of the Northern Himalaya. The height of this snowy range has only been taken on the Pass of Ishkasm, where it is 10,900 feet. The peaks have not been measured, but the range joins the Hindu Kush, at Nuksan Pass, which is 17,000 feet; and from thence a spur descends to Chitral, in the valley, which is only 7140 feet, where it meets the prolongation of the Northern Himalaya, which rises on the east of Chitral, in a series of peaks of 18,900 feet. We are inclined to believe that the Khoja Mohamed Mountains will be found to be prolonged across the Oxus, between Wakhia Bala and Wakhia Pain;* and, also, onward across the Surk-ab River, to the high mountains which divide the Zarafshan from the more southerly affluents of the Oxus, and terminate at Shahr-i-Sabz.

The western base of the northern prolongation of the Kuenlun is not well known, but it may be safely said to be very plainly defined on Captain Trotter's large scale map of the routes followed by the Havildar and the Mullah, and also on the third edition of Colonel Walker's Map of Turkistan.

It is in the valley which comes down from Tagharma Peak to Tashkurgan, where it has an altitude of 10,230 feet. It contains the Lesser Kara Kul (Lake) and also the Kizilyart Plain. Perhaps the Greater Kara Kul (Lake) may be found in it, as well as the headwaters of the Kashgar River, if not those of the Yamunyar and the Shah-naz, alluded to by Mr. Shaw. We are thus led up to the passes at the head of the Great Alai, and also to the Terek Pass at the head of the valleys that descend to the Sir Daria. This is indicated as a suggestion to future explorers.

The heights on the western side of this elevated valley appear to be already laid down on the maps previously quoted in a manner that warrants us in giving some account of them. They form at least for a considerable distance the water-parting between the Basins of the Oxus and the Tarim or Lake Lob. Their altitude is so far only defined at the Neza Tash Pass, where it is 14,915 feet. They are indeed the prolongation of the Karakoram Range, but we prefer to give them another name; and in deference to the great authority of Alexander Humboldt, who may be justly said to have been their sponsor long ago, that name should be the Bolor Mountains. If we attempted to follow them out to their northern extremity, they would land us in the range that bounds the Great Alai, where we are content to leave them.

Between the parallel ranges of Bolor and Khoja Mohamed, is the vast expanse which forms the summer pastures of Pamir, and has a breadth of about 250 miles. Although but little known, it is at present a fertile field of geographical speculation. We may, for example, question whether the Aksu or the waters that have their rise in the Little Pamir proceed, by the circular course indicated by Colonel Walker, to join the Oxus at Kila Wamar, or go on to the Surk-ab by a line parallel to the Bolor. We know not; but, as a suggestion, the question may be of use to an explorer, and prevent him from allowing any one-sided view to mislead him.

We have now traced out the Western extensions of the Himalayan System, in a manner which, it is hoped, will be found to reflect some light on the subject.

* Meaning Upper and Lower Wakhia. See Col. Walker's Map of Turkistan. Third edition.

The path has not been smooth, but we suspect that it will be found like a highway in comparison with the contrasts and utterly different structure which characterises the extensions of the system eastward.

IV.

The connection of the Himalayan System with the mountains of China is a subject upon which very little information exists, and we pursue it mainly for the purpose of promoting enquiry and the exploration of a very remarkable part of the Indian frontier.

The surveys of the Jesuits and Lamas throw no light upon altitudes, but we may depend on their delineation of the rivers in this part, especially since other parts of their work have been essentially confirmed by recent journeys to Lhasa.

In China the base of the snowy mountains, on its western frontier, is not defined with the precision which the great Plain of India gives to the base of the Himalaya, neither have trigonometrical surveys established the place and altitude of the culminating peaks. We are, however, informed by the Abbé Huc that the mountains on which snow was falling in June descend at Tatsienlu, and it will be seen that further north they separate the high plateau of the Upper Hwang Ho and Kokonor from the lower plains of China proper. An altitude of 1500 feet taken by Major Blakeston, at Pengshan, on the Yangtse River, affording a clue to the elevation of the lowlands in this part of Sz-chuen. As the Min is navigable up to Ching-tu, that city and the plain which surrounds it is not much higher, so that the Min may be considered to define that part of the base of the snowy mountains. The general level of the hills in Yunnan and Sz-chuen is reported to be about 5000 feet.

Batang is also situated in a low plain, distinguished by the warmth of its temperature from the elevated mountains around it. It was the first place where the Abbé Huc felt warm without a fire. We are thus here enabled to fix another point of the lowland; for, although Batang is surrounded by heights, it is situated on the Kincha, or Yangtse River, which descends from it to Pengshan, where the river is 1500 feet above the sea. The temperature of Batang indicates that it is not much more than 2500 feet, or 1000 feet above Pengshan. Nearly west-south-west of Batang, at a distance of about 200 miles, is Sudiyeh, on the Brahmaputra, the altitude of which is fixed by observation at 210 feet. Here we are in the plains of India, with the Himalaya stretched out east and west, and we think that some evidence has been offered in favour of the suggestion, that the heights of the Southern Chain of the Himalaya are continued by the Yunling, along the line which we have now traced, and which may also be followed in the map.

The Northern Chain of the Himalaya was crossed by Pundit Nain Singh, on his last journey, and he has enabled it to be defined as far as 92° east longitude. In this direction, following the Sanpu, it will no doubt coalesce with the Southern Chain (also crossed by him) where the Sanpu descends to the plains.

In another direction, the Northern Chain may be considered as extending from the mountains around Lake Palti to the chain on the north side of the Sanpu, and east of Lhasa. This range was crossed by the Pundit, and, before him, by the Abbé Huc. The Pundit fixed the height of the Gokhar Pass on it at 16,620 feet. Lhasa is 11,910 feet, and the Sanpu where he crossed it is 11,350 feet.

The Lhasa River divides this range from the Tangla or Gangri Mountains, on the opposite side of the valley; and we have prolonged it as the edge of a steppe as far as the Bayankara Mountains—a suggestion which seems to us to be concurrent with the aspects of the smaller streams.

In like manner, we have delineated a probable prolongation of the Gangri to the north, following a line of water-parting for a portion of the way, and then taking certain bends in the streams as indicative of their passage of a chain.

The eastern part of Tibet, between the elevated Lake Plateau and the Yunling Mountains, is probably of an entirely different character to the rest of the highlands in the central and western parts of the Himalayan System. It appears to be occupied by Sok tribes or Mongols, and is therefore called Sok Pa, or the Sok country. Sok is said to mean a pasture, and the word is considered to be the root of the classic name Scythia. The Lake Plateau is called Hor Pa, and is occupied by Turki tribes; and we believe that Hor means highland—at least, it does in some Oriental languages. These tribes represent two distinct types of the human race, namely—the red men and the yellow men, who, besides being distinguished by colour, differ remarkably in facial and lingual respects. Sok Pa is the Sokpo-huil which Mr. Hodgson rightly places on the east of Hor, but which Capt. Trotter is inclined to locate on the north of it. (*Report on Trans-Himalayan Explorations*, p. 91.)

It is, however, the features of the country itself that we feel sure will prove of the greatest interest to the scientific explorer, and particularly to the naturalist. It appears to be totally devoid of great plains or broad valleys, and to be cut up into high and narrow mountains, rising like a succession of walls and ramparts into the region of perpetual snow, and divided by valleys, ravines, gorges, and fissures of great depth, with rapid rivers rushing through them. Among the great rivers which rise in Tibet, the Indus, Sutlej, and Sanpu pass through the Himalaya in gorges divided from each other by several hundred miles. But the Salween, the Cambodia, and the Yangtse are supposed to flow in parallel gorges, for a considerable distance, within a few miles of each other, between Assam and Batang. It may well be imagined, then, for that and other reasons, that the accomplishment of the short journey of 200 miles between the Plain of Assam and Batang is one of the great *desiderata* of geographers. Mr. Cooper's failure to perform it, after two attempts, is no criterion of its practicability; and success would in all probability be followed by the general opening up of Tibet and the rest of the Chinese territories to India. We believe that it would be a great advantage to the Chinese and Tibetans if their intercourse could be carried on by way of Assam, instead of across the tremendous mountains which they now traverse.

We have just received the first volume of the magnificent work on China by Baron Richthofen. It is too late to attempt to examine his views on this subject, which, however, we can see, by a glance at his maps, is dealt with by him with a masterly hand. His work will be studied by every one who wishes to examine Himalayan geography. TRELAWNEY SAUNDERS.

THE INDIA-RUBBER TREES IN BRAZIL.

(Continued from page 157 of our last number.)

Search for Plants of the Tree yielding the Balsam of Copaiba—Capivi of Commerce.—I was recommended by Mr. Markham, just before leaving, to endeavour to obtain at Pará some plants of this tree which abounds in the forests of the Amazon Valley. These balsam trees have a wide distribution, and are likewise found dispersed in the forests of Guiana and Venezuela, and in the wooded littoral districts of New Granada, especially in the States of Santa Martha, Carthagena, and Panama. In those regions different species of trees varying in size and yield furnish balsam, but all are leguminous and belong to the genus *Copaifera*. The finest sort in commerce, called by the collectors White Copaiba, is met with in the province of Pará, and is shipped from Pará and Maranham. Very large quantities are annually sent to the French market.

After protracted inquiry, I discovered that few people really knew the tree, and I was beginning to think that I might not be able to obtain any knowledge of it, when fortunately I learned where a practical Copaiba collector lived. Formerly the tree might be seen growing in places easy of access, but owing to the method of collection practised it is now comparatively rare. At present a collector must make a journey, occupying several weeks, in a canoe up some of the Amazon tributaries, or penetrate into the dense forest lying between the rivers, to find any considerable quantity of Copaiba.

It cost me three successive journeys on foot, occupying three days, before I could arrange with the collector. He was drinking a supply of cane rum (*cachass*), and he would not go anywhere until it was finished. Few occupations are so perilous and fatiguing as that of the balsam collector. Exposed daily to the drenching rains in the depths of the forest, with often an insufficiency of food, bitten by large formidable ants, and tormented unceasingly day and night by swarms of mosquitoes, his life is of a wretched description. When living under these conditions, the smallest scratch from the underwood is apt to become a sore and increase to the size of a florin in forty-eight hours. On the 17th of September I left with the lad, and joined the collector at the entrance to the forest. The path led through a dense lofty vegetation, the majority of the trees being from 80 to 100 feet in height. The extremely fertile soil was of soft white sand, 20 feet or more in depth, covered by a thick surface layer of vegetable mould, with which the sand was intermixed. Slight undulations were traversed, and three little running streams were crossed, none of which contained more than a rill of water. The land was everywhere quite mealy and dry, and was elevated at least 50 feet above the region of the *gapós* or tidal floods. Large black ants, some of which were nearly two inches in length, called by the natives *candela*, ran over the ground everywhere. The bite of this ant is quite as painful as the sting of a wasp in this country. After travelling several miles we came to a balsam tree of gigantic dimensions. The saplings had been cut down around it by a person who lived some distance away, and who consequently was considered the owner. The tree appeared to be 80 feet in height, with a clear trunk of 50 feet. On account of the great thickness of the trunk and absence of branches, no one was able to climb it. The clearing away of the underwood admitting freely air and light had induced the tree to bear seed, which, however, was just beginning to ripen. Little perpendicular rents were observed in the bark of the trunk from 8 inches to a foot in length. From some of these which had occurred quite recently, a little balsam had exuded and flowed down the trunk. A diligent search for plants was made, and one small seedling was found by the collector which I rejected, as I doubted whether it was really a balsam plant. Without much loss of time, we continued our journey along a narrow path lined with tall grass and shrubs. At midday we came to some Copaiba trees, one of which had been tapped some years ago. It had a massive, lofty trunk and wide spreading crown, and must have borne many crops of seeds, but not one plant was to be met with. A further search beneath a number of other trees which were scattered about proved alike fruitless. The collector explained that the seeds on falling were immediately eaten up by an animal about the size of a rat. This fact fully accounted for the scarcity of seedlings. Everywhere underneath the trees a close network of little paths traversed the ground. We penetrated this day into the forest for a distance of 12 or 14 miles, and got neither plants nor seeds. I had a little fever afterwards for about a day, which, although mild, weakened me considerably. I felt that the daily exposure in the sun afterwards fed the symptoms which remained. On the 9th of October I took with me the lad, and returned to examine the Copaiba tree in fruit already noticed. A number of capsules were found beneath it, but all were empty. The ground was thickly covered with the little paths of the animal which had devoured the seeds. Whilst engaged in searching about, a gentle breeze of wind arose which, moving the branches, brought down a few seeds in the best possible condition. These were carefully gathered, and in all eighteen seeds were collected. Each little pod contains only one seed, which is coated over with a white wax-like substance possessing a delicious aroma. When this is removed, the seed is found to be black and about the size and form of a field bean. The time was at hand when I purposed to leave with the rubber plants, so as to get to England before the cold weather set in, but I resolved, if possible, to see the method of tapping the trees actually performed. This operation has not yet been accurately described by any traveller, and no scientific work or class book in the English language gives a correct account of the process, for which reason I take the liberty of recording my observations.

Early on the morning of the 13th October I proceeded to the forest, accompanied by the lad and the Copaiba collector. To each was assigned a fair travelling load, consisting of food or other necessaries; but the most prominent object was a large tin, capable of holding about forty English pints, which the collector carried on his back. We travelled by a path to a point beyond the place reached on a former occasion, and then diverged into the forest, where there was no track of any kind. Entering on a district where the trees were an amazing height, we, in a short time, came to a very large Copaiba tree. This, and a number of others, were previously known to the collector, who tapped one or two when con-

venient. I found he did not want the lad to see the largest of these trees, lest he might show them to others. On reaching the tree, he struck the trunk two or three blows with the handle of his axe, when a sort of hollow sound was produced. The grand, symmetrical trunk was clear of branches to a height of at least 90 feet, above which the crown spread out flatly, the slender interlaced boughs, clothed with little pinnate foliage, forming an agreeable shade from the rays of the sun. The circumference at 3 feet from the ground was 7 feet 2 inches. Several old fissures in the bark were observable, and one, which had occurred quite recently, was nearly 5 feet in length. Very little balsam had exuded. These rents are reported to be occasioned by the accumulation of oil in the tree, and that, when they happen, a loud report is heard.

The person who successfully taps a Copaiba tree must be a skilful axeman. A chamber or cavity is cut in the trunk not much broader than the axe, but sufficient to allow the workman to vary the course to the heart of the tree in such a way that he may not miss what is termed the "vein," or channel, usually met with near the centre, from which the balsam flows. The base or floor of the chamber must be carefully and neatly cut with a gentle upward slope, and it should also decline to one side, so that the balsam on issuing may run in a body until it reaches the outer edge. Below the chamber a pointed piece of bark is cut and raised, which, enveloped with a leaf, serves as a spout for conveying the balsam from the tree to the tin.

The collector commenced the work by hewing out with his axe a hole or chamber in the trunk about a foot square, at a height of 2 feet from the ground. The wood at first was white to a depth of 4 or 5 inches, when it changed to a purplish red, very much resembling a piece of old oak taken from a peat moss or bog. The whole of the interior of the tree is of this colour. When the centre appeared to be reached, I was about to remark that there was no balsam, when suddenly the collector laid down his axe, and called hastily for the tin. The balsam now came flowing in a moderate-sized, cool current, full of hundreds of little white bubbles, possessing a pearly transparency. At times the flow stopped for several minutes, when a singular gurgling noise was heard, after which followed a rush of balsam. When coming most abundantly, a pint jug would have been filled in the space of one minute. Owing to the diminished light, consequent on the thick masses of foliage overhead, I could not distinguish the "vein" in the heart of the tree; but I observed a number of fissures that appeared to radiate from the centre outwards. Whilst making these observations, I was surprised to see that the whole of the wood cut through by the axeman was bedewed with drops of balsam, and so also were the ends of the chips. This remarkable and important fact shows that every atom of wood in the tree contains a certain amount of Copaiba. The bark did not appear to possess a particle. In the course of an hour nearly one-fourth of the tin was filled. A little roof thatched with leaves was placed over it, as rain began to fall heavily. We then returned home. The collector considered the tin would be filled, and proposed to return for it in a couple of days. Although balsam may be seen slowly dropping from a tapped trunk for a month after it has been operated on, the common practice is to allow a tree, if it be good, only two or three hours to drain, and then proceed to another. Occasionally large trees are met with which, when tapped, yield little balsam. The cause of this has not been ascertained. Trees of the largest size, in good condition, will sometimes yield four "potos," equal to eighty-four English imperial pints. A collector, where trees are abundant, and with plenty of vessels, can it is said, make at the rate of 5*l.* per day.

Mr. Clough, an English missionary, in describing, in a recent work,* the method of collecting balsam, says that it "is obtained by making a gash in the bark of the tree, and plugging the space with cotton to absorb the juice which exudes." I will venture to state that not a drop would be obtained by this process. Nor is the practice, as stated by some, of closing the cavity cut in the tree, for a time, with clay or wax, to allow the balsam to accumulate ever resorted to. Even if tried, it would not answer, for a number of reasons. Balsam, as it comes from the tree, has a powerful, pungent fragrance, which is not particularly disagreeable, although on passing the doors of the houses where it is stored, at Pará, an odour, by no means pleasant, is experienced. Possibly some change may take place in keeping. Little, if any, care seems to be taken to preserve the commodity pure. Those who go up the rivers to collect on a large scale, take in their boats all descriptions of jars and barrels which may have been imported with liquors, grease, or any kind of article. Paraffin cans are special favourites, and so are much sought for. Most of those vessels, on being emptied, are stowed away in dusty places, uncorked and uncovered, thus affording free ingress to ants, spiders, and all classes of insects. It is urged by some that balsam precipitates all impurities, but even if this were so a better system might be adopted. As some of the seeds brought home have germinated at Kew, I may add a few remarks regarding the cultivation in India, whence a few plants should be sent when strong enough for removal. I trust care may be taken at Kew to keep this sort separate from other species cultivated there, mostly natives of the West Indies, and which, although interesting in what is termed a "botanical sense," are of no value for the production of Copaiba. The temperature required is the same as that for the Pará rubber tree, which at times is found growing beside it. Wet or marsh land must be avoided. The site should be of the best dry loam suitable for cane or coffee planting. The stock for planting will have to be obtained from seeds ripened in India, so that if a few plants can be transferred thither, they should be planted in good situations, where plenty of sunshine is admitted, in order that seed may be early produced. Seedlings may be planted tolerably thick, so as to shoot rapidly up, when they can be thinned out to proper distances.

I would not recommend the planting of these trees on a large scale, with a view to early profit, as the growth would be slower than Panama or Pará rubber trees. The return would, I think, be realised in about the same time as is the case with oak plantations. However, a few hundreds of Copaiba trees growing on a planter's estate ought to enhance the value of it. Apart

**The Amazon, a Twelvemonth's Tour* by S. Clough.

from the medicinal value of Copaiba, it might be well to ascertain if it would not be equal to castor oil for lubricating machinery. The journeys relating to this work were among the most fatiguing I have experienced in these countries.

Embarkation of the Plants.—On the 17th of October the cases containing the rubber plants were put on board the "Red Cross" steamer, 'Paraense,' which was proceeding to Liverpool, after touching at the ports of Maranham and Ceará. In the embarkation of the plants and other arrangements I had the best assistance from Mr. Green, H.B.M., Consul at this place. The Captain of the steamer, Mr. Brooking, also afforded me every facility for the care and protection of the plants during the voyage. On the 20th we came to Maranham. The entrance to the anchorage is cramped, difficult, and dangerous. A reef stretches nearly all the way across, so that a ship must go in at one end of it and back out by the same way. Much of the city is built over little low hills and steep declivities, and its extent is considerable. The population appears small in comparison to the size of the place. Many of the older dwellings, public edifices, and churches, are built with stone and lime, with massive walls, in the old Portuguese or Spanish style. The actual exports of the place are insignificant, but much produce is brought from adjacent districts and shipped here, owing to the low rate of port charges. It is curious to observe the superior varieties of plantains cultivated here and at various places on the east and west coasts of South America. These have probably all sprung from the common plantain, *Musa sapientum*, introduced by the Spaniards some time after the discovery of America, and have originated from offsets, and not from seeds. The cause of this mode of development cannot be explained, but it may be inferred that if the *Musa ensete*—first discovered by the accomplished traveller Bruce—with its leaves 14 feet long, had been planted in the same regions at an early date, varieties from it might by this time have resulted which in yield of fruit would have totally eclipsed all other sorts.

After a brief stay we sailed for Ceará, which was reached on the morning of the 25th of October. A ridge of rock here also runs across a great part of the bay, but there are two openings—one at each end—so that vessels enter in at the one and go out at the other. The greatest caution and vigilance, however, is requisite.

The city is spread gaily over the elevated sloping beach, at the head of the bay, with undulatory hills of sand on each side. The climate is comparatively dry, and, undoubtedly, the place is much healthier than Pará, although yellow fever is at times very fatal. Peculiar forms of nervous and rheumatic maladies are rather prevalent.

Examination and Collection of Seeds and Plants of Ceará Indiarubber.—On the morning of the 26th I went on shore, as I wished to gain some knowledge of the method adopted in the preparation and collection of the rubber exported from Ceará. I had to land from the ship in a *jangada*, which is a raft 12 or 14 feet in length, formed of moderately sized trunks of a tree fastened together and furnished with a mast and large sail. A piece of board, a foot in breadth and 4 feet long, is pushed down in the middle between two logs to serve as a keel. The tree selected for those rafts has a peculiarly light wood, said to be brought from Bahia or Pernambuco. With a good fair wind they are said to run sometimes at the rate of 15 knots an hour. The surf is so strong that no boat or canoe could often reach the shore safely. Even the *jangadas* are sometimes overturned, and when this happens there is a risk in getting a blow from the timbers of the raft—a danger considered greater than the sea. In the town I saw a large quantity of rubber in a merchant's store, and afterwards observed that it was freely traded in by most classes of shopkeepers. I expected to have seen the tree yielding it somewhere near, but, after travelling about over the sand hills and adjoining country for the greater part of the day, I returned to the ship completely tired. I was assured by a native, who said he knew the Pará rubber tree, and that of Ceará, that both were completely identical. But the great diversity in the climate induced me to think different, and so I resolved to follow out the dictates of my own judgment, and not be influenced by any one until I could satisfy myself on the matter. Yet there was little time to explore, as the steamer was expected to leave in a very few days. Next morning an Indian from the interior happened to come on board the ship, and I took the opportunity of asking him the names of some of the villages and localities in the retired districts. I knew from previous travelling a good number of the Indian substantives, with their meanings, and this, together with further conversation, enabled me to form some idea of the character of the region where the rubber was collected. A single line of rail, formed to facilitate the transport of sugar and cotton, runs from Ceará into the interior to a place called Pacatuba, distant about 40 miles. Contiguous are a number of large plantations, with some slaves.

On Sunday, October 29th, I landed with the *jangada*, and proceeded through the town to the railway station. I had previously arranged with a native to accompany me, but he did not appear, so I went off alone. Leaving Ceará, a flat, parched-up region was traversed, diversified by a few undulations and moist hollows. Thorny thickets of bushes and slender trees, chiefly myrtles and legumes, overspread the country, with many groups of the carnaúba palm, *Copernicia cerifera*, rising high above the ordinary vegetation. The crowns of these palm-trees, waved about by the wind, and visible over such a wide expanse, presented an appearance extremely picturesque, whilst in the distance beyond rose a multitude of conical peaks and mountains, the whole combining to form a landscape of unsurpassing beauty. After a journey of two hours, I stopped at a little village with about a dozen thatched houses, called Maracanahú. The distance may be 30 miles from Ceará. I went to a man and boy who were standing in front of a hut, and made some proposals to them to show me the locality where the rubber trees grew. The man was advising the boy to accompany me, who seemed rather reluctant, when a poor lad who had lost an arm came up, and at once consented to go with me. It was fortunate I met with this one-armed lad, as I could hardly have succeeded so well with any one else. I told him I wanted first to see trees that were being wrought, because I wished to make sure of the tree, and also observe the method of collection. We proceeded along a dusty path for some distance, at times running,

as I proposed, if possible, to return with the train which passed the village in the evening. Plantation establishments were seen, dispersed at wide intervals over the country. Cultivation was only carried on in very low, moist situations, or where the water during the rains was stored up in artificial ponds for irrigation. Some of these were so large that at first I took them to be natural lakes. After travelling for some time, the lad turned from the path and dived into the forest. In a few minutes he brought me among a number of rubber trees, which had recently been bled. The general forest was tolerably high, but the sparse, small foliage did not afford much shade from the fierce rays of the sun. The soil was in places a sort of soft sandstone or gravel, which was bound up in the most extraordinary manner. Neither grass nor weeds grew among the underwood, and there was an entire absence of ferns, mosses, and other plants. I soon saw that the tree was totally different from the rubber tree of Pará, and also that it would probably thrive perfectly over a very wide extent of the drier regions of India. At first sight it much resembles in appearance a birch tree, and the surface, or epidermis of the bark comes off in the same way, in thin silvery peelings. The largest of the trees were about 50 feet in height, with trunks 9 inches to 1 foot in diameter. The crown is divided into many branches, which grow in the form of a basket. The tree is deciduous, and there were neither leaves, flowers, nor fruit to be seen. I spent some time in examining attentively the process of bleeding the trees, and then commenced to search for plants. A few were found growing in an open space, but the roots were so firm that not one could be pulled up. It seemed strange that the lad and myself, exerting all our strength, could not pull up a young seedling plant, about 2 feet high. I therefore got a pointed branch of a hard wood tree, and scraped and dug about the roots, and in this way, with very arduous work, during which I hurt and lacerated my hands, some plants were uprooted. The real difficulty was now apparent. The roots of the plants were furnished with tubers, the largest of which were the size of kidney potatoes. These tubers, although quite near the surface, adhered with such tenacity to the sandstone, or hard gravel, that most of them had to be smashed, in order to get away an uninjured portion of root with the stem. In the young state they are soft and spongy, and are seen to contain milk, but afterwards become lengthened out, and form a part of the root. With diligent search and hard labour we succeeded in collecting eighteen plants.

At the station a number of natives from Ceará gathered round the "bundle of sticks," but could not make out what they were. However, an old man from the forest district came up, and, peering through the crowd, said "Manisoba." This is the Indian name of the rubber tree, which I knew before. I got back to Ceará just before dark, and fortunately found a *jangada*, on which I boarded. Thus in one day I was fortunately able to discover the origin of a tree hitherto unknown and undescribed, yielding an important article of commerce, and at the same time resolved the mode of collection and preparation, and secured a number of plants. It is true I had no instructions regarding this Ceará rubber plant, probably because it was supposed to be the same as the Pará tree; but I thought it would be well to secure more plants, and told the owner of the *jangada* to come for me in the morning. This sort of raft was expensive: each voyage cost me three *milreis* (6s.), and I could not possibly have got one for less. The distance was only about 300 yards. Next day the sea was very rough, and three *jangadas*, one of which carried the Brazilian Government mails, were overturned in the surf. The person I arranged with came for me, and I embarked. Although I was not in the least alarmed, the size and violence of the waves completely surprised me, while the *jangada*, at full speed, went groaning through the surf, covered by 9 inches or a foot of water. I cannot help wondering that not a farthing has been spent in improving the safety of these Brazilian ports. Returning to Maracanahú, I proceeded to an adjacent house, where I was previously told I could stay. The son of the owner assisted me in obtaining a quantity of seeds—700 in all. The pods, when ripe, burst and go to pieces, and so the seeds are showered on the ground. At daybreak next day we went in search of plants. We brought a strong iron hoe, as my intentions were to take up a good number, for I did not place much confidence in the seeds, although I am glad to state they have turned out well. Our course was directed to a more distant part than I had previously visited. Shortly after entering the bush-like forest, we came on a large tract of land, covered by immense masses of grey granite, some of which might be 50 tons or more in weight. These had been broken where they lay, and were the result of a volcanic explosion. Rounded masses of the same rock also cropped out in many places. Travelling now became very difficult, as we had occasionally to scramble from one block to another on our hands and knees. Many good-sized rubber trees were growing in the interspaces between those granite masses, but no plants were seen. The situation was very dry, but no doubt some seedlings had sprung up which, owing to numerous thickets of shrubs, were not perceived. After fully an hour of tiresome exploring, I resolved to go back to the place where I got plants previously. We there succeeded in collecting a number which, with those formerly gathered, amounted in all to sixty. The handle of the hoe broke, for which reason the work was not farther prosecuted. Taking with me the seeds and plants, I returned to the steamer in the afternoon.

System practised in Bleeding or Tapping the Trees, and Collecting the Rubber.—This is an operation of a very simple description. On commencing to work the collector takes with him a stout knife, and a handful of twigs to serve as a broom. Arriving at a tree, any loose stones or dust are swept from the ground around the base, and some large leaves are laid down to receive the droppings of milk which trickle down. Some do not go to the trouble of sweeping the ground or laying down leaves, for which reason the milk adheres to sand, dust, decayed leaves, and other impurities. The outer surface of the bark of the trunk is pared or sliced off to a height of 4 or 5 feet. The milk then exudes, and runs down in many delicate, tortuous courses, some of it ultimately falling on the ground. After several days the juice becomes dry and solid, and is then pulled off in strings and rolled up in balls, or put into bags in loose masses. Only a thin paring should be taken

off, just deep enough to reach the milk vessels. But this is not always attended to. Nearly every tree has been cut through the bark, and a slice taken off the wood. Decay then proceeds rapidly, and many of the trunks are hollow. In this condition the trees must yield far less milk, and many, no doubt, are broken over by the wind or wither away. Collecting is carried on during the dry season only, when rain seldom falls.

Climate and Temperature.—The flat country from Ceará running back to the mountains, in which the tree abounds, manifestly possesses a very dry, arid climate for a considerable part of the year. This is evident from the fact that mandiocca and other crops require to be irrigated. The rainy season is said to begin in November and end in May or June. Torrents of rain are then reported to fall for several days in succession, after which the weather moderates for a brief space. According to some statements there are occasional years in which hardly any rain falls. This assertion concurs with the aspect presented by the country in general. The daily temperature on board the ship ranged from 82° to 85° Fahr., but inland it is often, probably, 90°.

The localities traversed by me nowhere seemed to be elevated more than 200 feet above the sea. The situations selected for cultivation in India should possess a rather dry and sustained high temperature. In the comparatively low-lying coast country of the southern portion of the peninsula of India, including the districts of Madras, Cochin, Calicut, Cannanore, Mangalore, and Bombay, will be found many localities possessing all the conditions essential for the growth of Ceará rubber. The plant might likewise be tried in the deep tropical valleys of Assam, and, indeed, in all the parched regions of India within the limits of coffee planting. It may not be safe, at least until some experience is gained, to plant in any locality where the temperature at any time of the year falls below 50° Fahrenheit.

Propagation and Planting.—Seeds are early produced if the tree is not shaded. They should be buried in brown sand, kept pretty moist until there are indications of growth, when they may be planted out permanently. In some situations, where the ground is rough and stony, they may be sown broadcast. Meantime, I would suggest the formation of plantations by cuttings, which will take root as easily as a willow. These should be taken from the points of strong shoots, and may be one foot in length. In planting, each cutting may be put down in the soil to a depth of 6 inches. If scarce, the entire shoot may be cut into pieces, each possessing a bud, all of which will grow if covered with half an inch or so of soil. On loose, sandy soils or exhausted coffee land, plantations may be formed at little expense. Dry, hard, gravelly wastes, if found to support any kind of bush, are also suitable sites. Holes might be made in stony land with an iron jumper, and a stout cutting put into each and filled with pebbles. On bare or thinly covered portions of rock the cuttings might be laid down flat, and a little heap of stones, or any kind of *débris* about the size of a mole-hill, piled over each, care being taken that the extreme point of each cutting with a bud is left uncovered. I do not advocate planting in an entirely barren desert, but wherever there is any sort of stunted tree or scrub vegetation, with an occasional sprinkling from a monsoon shower the tree is likely to prosper. Ceará rubber occupies a good position in the market. The export has been stated to amount to 1000 tons per annum.

Arrival in England.—The steamer left Ceará on October 2nd, and arrived at Liverpool on the 22nd of November. The plants were deposited at Kew early on the morning of the 23rd. There were fully 1000 plants of Pará rubber (*Hevea Braziliensis*), in the best condition. Exclusive were the Ceará plants, all of which arrived sound, and have done well.

I have looked at the collections of dried plants in the State Herbarium at Kew, but no specimen could be found of the Ceará rubber tree. Judging from pieces of the capsules and the seeds, it would seem to belong to the same family as the Pará sort. From the fact that it has tubers attached to the roots, Professor Oliver, the Curator of the Herbarium, suggested its similarity to the Mandiocca (*Manihot*), and this, in some respects, is really the case. The tubers are probably poisonous, which, however, is a prominent feature of the *Euphorbiaceæ*, but in the form, markings, texture, and liability to rot when cut or bruised, they strikingly resemble some varieties of mandiocca.

Specimens of Indiarubber.—I have forwarded to Mr. Markham the following samples of caoutchouc:—

No. 1, prepared as follows:—An imperial pint of rubber milk was put into a tin can, previously blackened, and exposed for fully two hours to the sun, during the hottest part of the day. The lid of the can was put down close. The temperature obtained exceeded 150°, but only about the half of the milk coagulated. The mass was pressed, when a whey-like juice came from it freely. It was then put to dry.

No. 2 formed the remaining portion of the milk. It was put into a shallow tin vessel, and evaporated at 212°. Every drop of the milk coagulated. The entire produce of the pint was found to weigh ten ounces. This yield exceeds any calculation I have seen on the subject, but I did everything correctly. In the process followed with No. 1, it was probably the richest portion of the milk that thickened, as may happen in the same way with various principles obtained from vegetable structure.

Nos. 3 and 4 comprise a "biscuit" and half biscuit of rubber, prepared by the smoking process, as already described. These and the previous preparations are from trees whence the plants were obtained yielding the white variety. It abounds chiefly in the lower districts of the Amazon Valley.

No. 5. A choice sample of seasoned rubber, kindly selected for me by H.B.M. Consul, Mr. Green.

No. 6. This is a black sort of rubber, and in appearance agrees perfectly with a species described by Dr. Spruce, which he saw wrought on a tributary of the Upper Amazon. Some Pará merchants say that it is not so elastic as the white variety.

No. 7. The best kind of "Negrohead," or *Sernamby*, resulting from detached portions and droppings during the smoking operation.

No. 8. "Negrohead," or *Sernamby*, being the gatherings from tapping cups.

No. 9. A small piece of Pará rubber, prepared by the German method with alum. A few grains of finely powdered alum were thrown into a little milk and stirred, when it coagulated in less than a minute.

No. 10. "Mangaba" rubber, obtained from a shrub

(Hancornia species) growing along the southern coast of Brazil. German merchants have taught the natives to prepare it with alum. It brings a low price in the market.

No. 11. Ceará rubber of commerce, now being introduced into India.

ROBERT CROSS.

(To be continued.)

Livingstonia.—Intelligence from Dr. Stewart and his party, at Livingstonia, on Lake Nyassa, has been received at the Cape up to the end of February 1877. The health of the party has been fairly good, and people are coming into the settlement for the sake of protection. Thus Livingstonia is becoming an anti-slavery centre. As many as twenty-two men, women, and children were rescued from slavery towards the end of last year, and brought safely to the settlement on board the little steamer 'Ilala.' The chiefs are told that any one running away to escape from being sold will be protected. In February about a hundred fugitives were being fed daily, in exchange for work at house buildings, roads, or in the fields. In the middle of February the first tusk of ivory was brought into the settlement, and bought by Mr. Cotterill for 14*l.* The first visitor arrived at Livingstonia from the Punjab, an engineer named Stewart, who had been working on the Sirhind Canal, and had received two years' furlough. He came to pass a year of it in Livingstonia as a volunteer, from interest in the enterprise and in the success of missionary work. He will be of great service as an engineer, his first undertaking being a survey over a road round the Murchison cataracts.

Mr. Henderson had established the Blantyre Mission Station at the head of the Shire navigation, about 3000 feet above the sea, in 1876. The temperature is equable, drainage good, the settlement being on a knoll, with the ground sloping away in every direction. The water supply is also good. Blantyre is about three days' march from Lake Shirwa, and two days from Pimbe, on the Upper Shire, the place to which the 'Ilala' steamer comes down from Livingstonia. The natives are reported to be peaceable and intelligent, and the country consists of hill and dale, well wooded, and bounded by lofty mountains.

Russian Travellers.—We learn from the last number of the *Russische Revue* that Colonel Prshevalsky left Korle, near Kashgar, in the beginning of November, and proceeded down the Tarim to the Lob Nor, which lies at an elevation of only 2000 feet above the sea level. On the shores of that lake he discovered the ruins of two towns, and then proceeded south to the Altyn Tag, 11,000 feet in height, where he successfully hunted wild camels. He proposes to be back at Kulja in July.

Capt. PEVTZOF, last year, explored the country between the Zaisan and Guchen. He collected many specimens of natural history, and is at present engaged upon a map of North-western Mongolia.

M. MAINOF started in May last for the Volga, where he will examine into the condition of the Finnish tribes.

Reviews.

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THE SAILORS' POCKET BOOK: a Collection of Practical Rules, Notes, and Tables for the use of the Royal Navy, Mercantile Marine, and Yacht Squadrons; illustrated by Wind and Current Charts; Diagrams explaining the Law of Storms, &c. By *Captain F. D. G. Bedford, R.N.* 3rd edition. (J. Griffin & Co., Portsea, 1877.)

IN the third edition of *The Sailors' Pocket Book*, Captain Bedford has once more done his best to merit the encouragement given to the work by the public. By availing himself of the assistance of Admirals Ryder, Shadwell, and Bedford; Captain J. C. Wilson; Commander H. H. Grenfell; Staff Commanders V. F. Johnson, E. H. Hills, and J. C. Richards; Chief Engineer George Tuck; Dr. D. J. Duigan; and, lastly, of Staff Commander Thomas A. Hull, who appears to have acted as chief of the staff, Captain Bedford has shown considerable generalship; and in thus uniting the intelligence of so many officers, well known in their respective circles, has proved how much we are indebted to the labours of that rarely-appreciated man, the painstaking compiler.

Each section of this third edition has been carefully revised, while some have been considerably enlarged; yet by using a superior paper the actual size has been but little increased, and it is still "a pocket book." Section II., on the Standard Compass, now contains simple instructions, showing how to place the magnets for the mechanical correction of the deviation of the compass—an important contribution in these days of iron ship-building. A few practical notes on coast and ocean piloting have been added to Section III. In these notes the author points strongly to this important fact, that "the mastery of the ocean cannot be learned on shore, but can only be acquired by a capacity for taking trouble, unremitting attention, and incessant practice on ship-board and at sea."

In Section IV. a diagram has been introduced, illustrating with singular force and simplicity the law of revolving storms. Placing side by side the track of a West Indian hurricane, and that of an Indian Ocean cyclone, the compiler has shown the sailor at a glance the different effects caused by the opposite movement of these storms in northern and southern latitudes; together with the best course to be followed in both cases by vessels encountering these destructive whirlwinds. This diagram alone is a valuable addition to the work.

The Passage tables have been revised and enlarged, and a few notes on Great Circle Sailing added, including the Astronomer-Royal's rules. The article on Tides has been considerably improved by a short but clear and comprehensive description of the tidal streams in the English Channel. Another diagram has been inserted illustrating the application of Burwood's and Davis' Azimuth tables to Sumner's method of finding the position of a ship at sea. A few remarks treating on Time as an element in the science of navigation will also be found useful to young sailors.

Yachting and boating men will derive considerable information from a perusal of Section VI. Sir Garnet Wolseley's notes on Bush-fighting improve Section VII.; while "Telegraphic Weather Intelligence," and Mr. Thomas Brassey's notes on a "Volunteer Fire Brigade" in ships, add interest to Section VIII.

In Section IX., the notes on "Timber" will be handy to sailors who may have to replace a spar; while in Section X. the latest information with regard to "Particulars of Docks abroad" has been inserted, and errors that have been discovered in the "Foreign Sea Terms and Phrases" corrected.

The Appendix contains two important notices lately

issued by the Hydrographic Department on the passages between Australia and China, and on the inshore navigation between Hong Kong and the Yang-tse Kiang; also the Admiralty Circulars on the examinations at the Royal Naval College and at the Hydrographic Department. The attention of officers desirous of adding the qualifications of pilot to those of seaman and gunner s call ed especially to pages 479 to 489, wherein a few examples of the questions that may be asked under ieach section of the examination are given. By this means officers preparing to pass for pilotage are made familiar with the manner in which this inquiry into the knowledge they possess is conducted; and these few pages will tend to direct their thoughts towards those small but essential practicalities, on the thorough acquaintance with which their success as sailors must chiefly depend.

A list of the principal seaport towns in connection with the telegraph stations of the world, and a very comprehensive index, completes this valuable addition to the necessary select library of a sailor at sea. The clear and concise style of its many short and vigorous paragraphs shows that the compilation must evidently have been the result, not only of much thought and judicious selection, but also of a thorough acquaintance with many "important simplicities of a sailors' profession."

We are pleased to see that this edition is dedicated, by special permission, to the Captain of the Royal Naval Reserve; another small proof of the great interest H.R.H. the Prince of Wales takes in all matters connected with the sea.

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HANDBUCH DER ERDKUNDE, von *G. H. von Kloeden.* 3rd Band. Berlin (London, Trübner).

KLOEDEN'S *Handbook of Geography*, of which a third edition is at present being published, enjoys a high reputation in Germany, and in some respects deservedly so. There is collected in it a vast amount of statistical information, and the accounts of the physical geography of the countries described, though very concise, are on the whole satisfactory. At the same time we feel bound to state that the work bears traces of hasty and indiscriminate compilation; that there is too much padding; and that errors of commission and omission abound in it. In the description of Brussels, the new exchange and law-courts, though probably the finest buildings of that beautiful city, are not mentioned. We have examined with some care into Herr Kloeden's description of the British Islands, and discovered there a large number of statements which will amuse those better acquainted with the subject than the author, but cannot fail to mislead the majority of his readers. In South Britain and throughout Scotland, we are told, the names of towns, villages, castles, mountains and rivers are Celtic. Falconry, dog, rat, and cock-fighting are enumerated amongst the popular sports of England, and at the latter, "estates are lost and won." The author knows nothing about any Reform Bill past subsequently to 1835; nothing about the disestablishment of the Irish Church; and describes coroners as "executive officers of the police." His notions on the "Estates" or Staende, are rather amusing. The commonalty includes the gentry and the other classes of the people. The "*gentry*" includes most educated people, viz., (1) baronets and knights; (2) younger sons of peers and baronets; (3) all members of the House of Commons and squires; (4) barristers, superior government officials, men of learning, artists, and officers of position, all of whom are eligible for the House of Commons, as well as the clergy; (5) merchants. About 250,000 families belong to the gentry.

The lower classes of the people include (1) shopkeepers, small manufacturers, mechanics, capitalists, and all other private persons not supported by manual labour; (2) farmers, a very wealthy class; (3) freeholders or yeomen, who are feudal tenants, emancipated in 1660, the feudal lord still retaining his right to hunt and fish over the lands; their number is diminishing; (4) copyholders, they have no votes, and are likewise diminishing rapidly.

From the description of London we learn that that "portion of Westminster which lies to the east of Hyde Park, contains the residences of many noblemen, the leading club-houses, fine streets, fashionable Grosvenor Square, and three modern quarters of the town usually called Tyburnia, Belgravia, and May-Fair." Her Majesty's Theatre in the Haymarket is the largest in the world, La Scala alone excepted; Phelps still delights audiences with Shakespearean performances at Sadler's Wells; and Almack's fashionable balls, "carried on by ladies of distinction," are not a thing of the past. The freedom of the city is granted to every respectable person on payment of 6*l.* 5*s.* 4*d.* These freemen pay neither tolls nor other dues throughout England; they alone can open a shop in the city, and no toll is levied upon their goods or carts at the six city gates, and, if inclined that way, he may hunt in Middlesex. The city authorities still levy a toll of 1*d.* or 2*d.* at six toll bars upon carts and merchandise not belonging to freemen.

Surely, Herr Kloeden, by consulting works of greater authority than those to which he has confined himself, and by exercising his own judgment, might have managed to write a more satisfactory account of the British institutions than the strange jumble of truth and fiction which he presents to his readers.

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GEOGRAPHIE DES WELTHANDELS, von *Dr. Karl Andree.* 3rd Band (Europa), von *H. Glogan* and *M. Haushofer.* Stuttgart (London, Trübner).

DR. KARL ANDREE only lived to complete the first two volumes of his *Commercial Geography*, of which the first deals with the modes of commerce, commercial highroads, and the geographical distribution of commercial products, whilst in the second are described the non-European countries. The continuation of the work was entrusted by the publishers to Herr Glogan, the Secretary of the Chamber of Commerce at Frankfort, and to Dr. M. Haushofer, of Munich. It now lies before us in its complete form; and although, owing to the procrastinating manner in which it has been published (the first volume appeared in 1867), some of the statistics are not quite up to date, it embodies a vast amount of information of permanent value and of the highest interest. The book has been written with the avowed purpose of furnishing information of interest to merchants and manufacturers, and subjects hardly touched upon in other geography books have been dealt with at full length.

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NOTES ON THE COLONY OF VICTORIA. By *H. H. Hayter*, Government Statist of Victoria. (Trübner, 1876.)

A REALLY marvellous picture of the progress which a colony can make within a period of forty years from the time of its earliest settlement is presented by the *Victoria Year-Book*, or Report of the Government Statist for the Colony of Victoria. In the year 1836 it numbered a population of 224 souls; the total number in 1874 was 808,437; the public revenue was 4,106,790*l.*; the exports exceeded fifteen millions in value, and the public debt was twelve and a half millions in the same year (1874); and, last, but not least, is credit due for the excellent manner in which the Government contrive to amass statistical information on every point of interest connected with the administration and progress of this important colony.

Correspondence.

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THE SCURVY THEORISTS.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—My experience of long voyages on board American ships, where lime-juice is not served out, confirms what has been said by Dr. Black and others on the subject of scurvy. To perform any given amount of work, a certain proportion of fuel is required of proper quality, and, in order to get the full amount of work out of it, thorough combustion is necessary.

This applied to the human being means, that to enable a man to perform a given amount of work a certain portion of nutritious food is absolutely necessary, and that the man's stomach should be able to thoroughly assimilate or consume this food. Now, it is quite evident that the lime-juice cannot by any possibility take the place of the nutritious food; the most it can do is to help to keep the digestive organs in good working order, whereas, in some English ships, owners appear to think that, provided lime-juice is furnished, they need not pay particular attention to the quality of the provisions. And medical men, when they inquire into scurvy cases, appear to think that if salt meat is sweet it is therefore nutritious and wholesome.

By constant care and change of pickle you may keep salt provisions sweet for an indefinite time, but no more nutriment is left in them than in so much sun-dried grass (not hay). Meat that is salted down in a hot climate soon parts with its nutritious properties. Our medical men require to use their judgment a little more, and their traditions a little less.

I am myself a profound sceptic as to the merits of lime-juice in preventing scurvy, potatoes are a far better preventive.

I am, &c.,

A CAPTAIN OF TWENTY YEARS' STANDING.

June 9th, 1877.

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TURKISH TRIBAL NAMES.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—Having for some time been engaged in investigations into the ethnology of Eastern Asia at the earliest dawn of authentic history, I think I can throw light on some of the names mentioned in connection with the Turks in Mr. Howorth's letters to your journal, as likewise in his work the *History of the Mongols*.

I shall begin with the Komans (see *Geog. Mag.*, Jan. 1877). Mr. Howorth inclines to the view that the name is derived from the River Kuma. If there be any connection between the two, I should rather derive the name of the river from the tribe, more especially as, according to Mr. Howorth's authorities, the district itself came to be called Kumania, and a similar name seems to have been in existence in Pliny's time. In the *Shi King*, or "Book of Poetry" (see Legge's *Chinese Classics*, vol. iii.) we find mention of a tribe called in modern Chinese Hien-Yün, but which in the older form is Hîm-wan, whose inroads seriously threatened the existence of the kingdom of the Chows.

The Ode (II., iii. 3) describes a marauding expedition against the capital, Haou. Mr. Kopsch (*China Review*, (vol. iv. pp. 104 *et seq.*) gives from other sources the story of the capture of the capital and the virtual extinction of the power of the Chows B.C. 770. The Hîm-wans have by Chinese authors from Sz-ma T'sien downwards always been connected with the Jung or Hiung-nû, who were undoubtedly Turks, and the Shi-ki, in describing the attack on the capital, calls the hordes who took part in it the K'iün-jung, or "Dog" jung. The feudal states tributary to Chow determined to avenge the insult, and, mainly through the assistance afforded by T'sin, then rising into importance, succeeded in repulsing the Hîm-wans, and driving them back to their northern settlements. T'sin, however, in return for the service rendered, took possession of a great part of the old territory of Chow, and the restored kings had to move their capital eastward to the neighbourhood of Honan-fu.

The name Hîm-wan only occurs in the "Book of Poetry," and even there (II. i. 8) is identified with the more general appellation of the Western Jung. I am therefore disposed to look upon them as a tribe of Turkish race who, about the eighth century B.C., poured down on the old kingdom of the Chows, the power of which they broke, but, being eventually defeated by the tributary states, they changed their line of migration and marched westwards. We do not meet with them again for seventeen centuries, but when we do encounter them we find them on the extreme western flank of the Turkish migration in the south-east of modern Russia. This would tally with the early date of their attack and defeat at the hands of the Chows. They were one of the earliest of the hordes, and so would naturally be found in the forefront of the advance westward.

The second tribe to which I shall allude is that of the Karluks. Mr. Howorth places them at the beginning of his history along the flanks of the T'ien-shan. The Tso-chuen, B.C. 659, tells us, that, at that time, a Turkish tribe, denominated the Kaou-loh, inhabited the mountainous district between Shansi and Pechihli. The state of Tsin, then nearly conterminous with the present Shansi, was anxious to attack them, and an army was raised, and placed under the command of the Crown Prince. Prudential considerations prevailed to prevent the expedition having any decisive results, and the Tsin army was permitted to return without any important success. The word Kaou-loh, which, by restoring the juh-shing ending, becomes Kaou-lôk, is apparently to be identified with the Karluks of Mr. Howorth.

The third tribe is the Hiung-nû. Before reading Mr. Howorth's work, and, reasoning from philological grounds alone, I had already concluded that the original pronunciation of the tribal name was Kara Nûr, or Kara Nîru. The time of the decay of the Chow empire, and the rise to power of the T'sins, was marked by extensive changes in the spoken language of Northern China. On all sides there was a coalescence and an absorption of tribes of different races, and out of the mixture thus induced arose the modern language of China.

Up till about the year 430 B.C., the Turkish hordes had been designated by a character pronounced in modern Chinese "Jung," and the particular tribe referred to had been known as the Kiang or Kang-Jung. The elements of the older and more recent name are, however, similar; Kang and Hiung point to an older Kar or Kara, while *j* and *n*, as initials, are notoriously interchangeable in Chinese dialects. Hiung-nû, or "wrangling slaves," was just such a rendering of the name of the tribe as would suit the habits of the Chinese, who to the present day are always ready to bestow opprobrious nicknames on those outside the pale of the Middle Kingdom. Occasionally the tribe was denominated the Yin Jung, *i.e.* Dark Jung, the distinguishing title being translated, in place of merely imitated.

Up to the time of seeing Mr. Howorth's book, I had rather inclined to connect the ethnic name with Turkish Niru (*strength*), than with Nur (*light*), owing to the apparent contradiction in terms of applying to the latter the distinguishing prefix Kara. The account given (pp. 37-38) of the tribal appellation Nirun, and the myth of its origin, would seem, notwithstanding the discrepancy, to point to the latter as the real origin of

the title. The empire of the Hiung-nû—*i.e.* Kara Nîrus—was broken up by the Hans in the first century A.D., and the tribe had to retire to its old seats about the head waters of the Irtish. Here the old tribal name and the old tribal myths not unnaturally survived, and finally merged in the family of which Genghiz Khan was an offshoot. Whether the name suggested the myth, or the myth preceded the name, may well remain a moot point.

THOS. W. KINGSMILL.

SHANGHAI, *April 20th*, 1877.

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THE NAVIGATION OF THE AMU-DARYA.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—The question of the navigation of the Amú-Darya, as affected by the available supply of fuel to be found on its banks, is of so great importance, both in a commercial and military point of view, that I venture to annex, for the benefit of your readers, the following quotation from Alexander Burnes's *Bokhara*, which seems to throw light on the question raised by Major H. Wood, in the May number of the *Magazine*.

Though the condition of the stream and the vegetation on its banks may have changed during the forty years which have elapsed since Burnes visited it, still the authority of this distinguished explorer of Central Asia would appear to warrant the belief that the dwarf jungle *Puku*, or *Sheesham* tree grows naturally, in considerable abundance, along the banks, as the mulberry and white poplar do on its northern tributaries, and that all three might be easily cultivated, in proportion as commerce and the consequent demand may hereafter increase; much in the same way as we see the poplar and alder cultivated along the banks of the Danube, and felled in strips, at a suitable age, for the fuel of the steamers.

"The boats on the Oxus are of a superior description, though they have neither masts nor sails. They are built in the shape of a ship, with a prow at both ends, and are generally about 50 feet long and 18 broad. They would carry about 20 tons English; they are flat-bottomed, and about 4 feet deep: when afloat the gunwale is about 2½ or 3 feet above the stream, for they do not draw much more than a foot of water when laden. They are constructed of squared logs of wood, clamped with iron, each about 6 feet long, formed of a dwarf jungle tree called puku, or sheesham, which grows in great abundance on the banks of the river, and cannot be procured of greater dimensions."—Page 169.

"Below Bokhara the supply (of boats) increases, and there are about 150 boats between it and the delta, chiefly belonging to Khiva. Here they are not used as ferry-boats, but are used to transport merchandise to and from Bokhara."—Page 170.

"The number of boats on the Oxus is certainly small, since they do not amount to 200; but there is every facility for building a fleet, the supply of wood being abundant, and, fortunately, found in single trees along the river, and not growing in any particular spot. There are no cedar or pine trees brought down by the inundation, which I hold to be a conclusive proof that the mountains, from which the Oxus and its tributaries flow, are destitute of that wood. The only other trees which I saw on the river are mulberry and white poplar, which are floated down in quantities from Hissar to Charjui, and applied to the purposes of house-building."—Page 171.

"The advantages of the Oxus, both in political and commercial points of view, must be regarded as very great. The many facilities which have been enumerated point it out either as a channel of merchandise, or the route of a military expedition. Nor is it from the features of the river itself that we form such a conclusion. It is to be remembered that its banks are peopled and cultivated. It must, therefore, be viewed as a river which is navigable, and possessing great facilities for the improvement of that navigation."—Page 172.

I am, &c.,

R. E. CARR, Major 36th Regt.

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THE AMAZONS AND ITS TRIBUTARIES.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—In his letter in the June number of the *Geographical Magazine*, Mr. Révy somewhat misinterprets a passage of mine (in your May number), which, however, with much fairness, he quotes before animadverting on it.

My meaning was not that the tide has a momentum up stream when the current is down, but that the momentum of the tide, *where it runs up stream*, carries it to a higher level than the high-tide level at the river-mouth, and thus affects the tidal rise as far up the river as there is any.

Mr. Révy much under-estimates the tide of the Amazons, when he compares with it, and argues to it from, the very weak tide of the River Plate. "Fitzroy," writes M. Elisée Reclus, "was the first who pointed out a region of the ocean where contrary tides maintain the surface of the water in equilibrium. This region is the estuary of the River Plate. . . . . The tides there are scarcely anything. The strong oscillations of the level that have been observed in that estuary are due almost wholly to the regular breezes, &c."* Whereas, "in the Amazons River, at the equinoxes (when the equatorial tide is at its maximum), during three consecutive days, bores of 12 or 15 feet high rush up the river with each high water; so that along the course of the stream, up which for 200 miles from its mouth no less than eight tide waves are simultaneously advancing, as many as five bores are sometimes at once in progress."† Indeed, "in the Amazons the 'bore' rises, it is said, in three successive waves, attaining together from 30 to 50 feet in height."‡

It is but right to quote one more passage from the work of M. Reclus:—"As to the high tide [in rivers], its shorter duration does not allow it to rise to a much higher level than that which it attains on the strands and cliffs by the ocean."§ And his diagram shows that in the Garonne the difference is only about 4 feet. But my position is, that the tide of the Amazons, like that of the Severn, is a typical high tide, and so mentioned by every writer on physical geography, whereas that of the Garonne is not.

The really strong point of Mr. Révy—and I readily admit that it is a very strong one—is his own accurate determination of the current and inclination of the river Paraná; for it is, as he justly says, improbable that the Amazons should have a greater inclination than the Paraná. It is very fair to set this against the barometrical determination of the height of Manáos; but not to depreciate or "drop" a result obtained from about 9000 observations, because three other observers (from some half-dozen observations in all) have obtained results widely differing from it and from each other.

In the equatorial region barometrical determinations of height admit, I think, with safety of limits rather

* M. Elisée Reclus, *The Ocean* (Woodward's translation), vol. i. p. 111.
† Sir J. Herschel, *Physical Geography*, §. 75.
‡ *The Ocean*, vol. i. p. 120.
§ *Ibid*, vol. i. p. 123.

less strict than Mr. Révy lays down; but it would lengthen my already long letter too much to discuss this question.

I am, &c.,
W. CHANDLESS.

—:o:—

INDIAN FAMINE TAXES.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—You have been good enough to allude to me, in the *Geographical Magazine* for May, as administrator of the famine in Sholapoor, 1833-4. Will you allow me to point out that the condition of rulers and ruled were not then as they now are. We held a much closer connection with the traders, and they were more ready to accept responsibility. The system of taxation of Mahratta rule was still in practice. All inhabitants (not cultivators) were liable to pay Ghur Puttee—house tax; Oodeern Puttee—occupation tax; Kusub Veera—business cess; and Mohturfa—trade tax. All classes were liable to the *Dherun Puttee*, or Famine tax; but this was never levied under our rule in the Poona division of the Deccan, and I do not know if it was on the list of taxes elsewhere. These taxes, and many others, were reported on by me in 1834-5. Those in the city of Poona were commented on by me, and finished by Mr.—now Sir Bartle—Frere. In reporting I suggested that the objectionable taxes should be retained on the books, as times might come when they would be required. Mr. Williamson (afterwards Ramsay), our Revenue Commissioner, thought otherwise,—advising the Government to remit them, with a promise of never using them again. This was effected in 1836.

We were in another position in those days: officers in charge of districts took responsibility on themselves. Famine labour was unskilled; I had no supervision available for new work; I was forced to employ it on such work as it could perform, under such supervision as I had. I was Revenue Officer, Magistrate, Police Officer, Superintendent of Public Works, &c. Village walls and cleaning out tanks were the only works on which I could utilise the famine labour with any economy; I gave no wages, but organised a system of rations variable with weekly prices, and notified to all. The acceptance of this ration was all the proof of *bonâ-fide* want that I required; I had no time to waste on inquiries,—daily labour and daily food was a sufficient test. It does not now seem as if officers in charge of districts acted on their own authority; so that if the Government can supply sufficient superintendence, and if economy is of no consequence, unskilled labour can be used on works requiring skill, and wages can be given instead of rations. The labour of distribution of the latter fell on the shopkeeper; that of the wages falls on the poorly paid Government servant!

I am glad to see that you, Sir, advise a famine code; is it not strange that this has never yet been digested?

Yours, &c.,
H. P. MALET.

The Scientific Club of Vienna.—We are in receipt of the first annual report of the "Wissenschaftliche Club," founded at Vienna in April 1876, which has found a suitable home in the house belonging to the Society of Architects and Engineers. The club already numbers over 600 members, and its programme promises instruction as well as amusement. It includes popular and scientific lectures, the formation of a library, a reading-room supplied with nearly 300 periodicals, scientific excursions, and social meetings.

Proceedings of Geographical Societies.

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ROYAL GEOGRAPHICAL SOCIETY.

Meeting of 14th May, 1877.

PUNDIT NAIN SINGH'S JOURNEY IN GREAT TIBET, FROM LEH, IN LADAKH, TO LHASA, AND HIS RETURN TO INDIA *viâ* ASSAM.*

Sir RUTHERFORD ALCOCK, President, on taking the chair, explained that Captain H. Trotter's paper on Explorations in Eastern and Western Turkistan was of a more limited scope than intended, owing to Capt. Trotter being called to accompany Sir Arnold Kemball to the seat of war in Asia Minor. The paper of the evening was thus restricted to an account of Pundit Nain Singh's journey across Tibet in 1874-75.

The Pundit, with three servants, left Leh, on his final and most important journey, on the 15th July 1874. His progress was slow, as all the baggage had to be carried by sheep, which generally carry loads of from 20 to 25 lbs. The route lay first through the northern portion of Western Tibet, or Nari, and thence along a wide grassy valley, abounding in wild asses, antelopes, and gigantic sheep, and inhabited by the Kampas, a tribe which emigrated from Eastern Tibet about a quarter of a century ago. On September 17th the gold fields of Thok-Daurakpa were reached, which, with two smaller ones further east, yield 8000*l.* per annum. For many marches beyond, the snowy peaks of the northern Himalaya (Gang-dis-ri) Range were plainly discernible for 180 miles. No cultivation was to be seen along the Pundit's route for a distance of 74 marches, between Chabuk Zinga and Lhasa, except in the district of Ombo, the elevation of which is 15,240 feet. There is a tradition that many centuries ago a great king (Gyalpo) lived at Ombo, and reigned over the whole of the Hor country. Thence to the great Tengri Nor, or Namchu Lake, the drainage was from the mountains separating the plateau from the valley of the Brahmaputra, to the north, into a vast system of land-locked lakes, discovered by the Pundit, two of which are 40 miles long. The Pundit reached Lhasa on November 18. He only stayed two days, for fear of detection, and, after visiting the ancient monastery of Samayegonpa—where the images are of pure gold and there is a large Buddhist library—he continued his course for two days down the Brahmaputra, and crossed it at the lowest known point on its upper course, where it is 500 yards wide and 20 feet deep, with a sluggish current. At Chetang, a large town on the right bank, he learned that the river flowed eastward for 30 miles, and then turned south-east. He ascended the Yelung, a tributary of the Brahmaputra, and crossed the central Himalaya at the Karkang-la Pass, 16,210 feet above the sea. At Chona-jong there is a great exchange mart, where the Tibetan merchants meet those from Assam. After being detained in Tawang for some months, the Pundit eventually reached Odalguri, in Assam, on March 1, 1875. This exploration has yielded rich and valuable results—a route survey of 1319 miles of previously unknown country; 276 latitude and 497 height observations; a system of numerous lakes and rivers has been discovered; the great snowy Gang-dis-ri Range has been proved to exist; 30 miles of the Brahmaputra have been discovered; and the Tawang route from Tibet to India has been surveyed.

The PRESIDENT said that this last journey of Pundit Nain Singh was of special interest at the present time,

* For a more detailed account of the Pundit's last journey, see our number for June 1876; see also the map facing page 173 of our present number.

because the English Minister at Pekin, in his recent convention with China, had stipulated that there should be a right of travel from China across Tibet into India, opening up the very route which Nain Singh had traversed. Every part of Central Asia was becoming daily of more interest, politically, and even commercially. Such journeys as that which the Pundit had accomplished were full of peril and wasteful of human life, and therefore the Pundit was entitled to great praise.

Colonel H. YULE said, although he had not himself been in Tibet, he was in a similar position to every one present. Some few Europeans might have got, as it were, upon the margin of the region, but in the course of many centuries very few had actually entered on the great plateau. If only the journey of the Pundit from Ladak to Lhasa, which had just been described, was considered, it might seem that not much had been accomplished; but the labours of Nain Singh must be taken as a whole. This was not his first journey. In 1865-6 he made another and a more important journey of about the same length, when he visited Lhasa, and traced nearly the whole course of the great river which was generally identified with the Brahmaputra. The Pundit Nain Singh was the first who had given accuracy and substance to the map of Tibet. He had fixed the position of Lhasa and of the great river, and carried a diagonal from Ladak to Lhasa. Though Tibet had been entered at various times by European travellers, unfortunately none of them were geographers or surveyors. About the year 1660 or 1670, two Jesuit priests travelled from Suining to Lhasa, then to Kathmandu, and into India; but the account of their journey was very meagre, and they took no observations. Afterwards an Italian priest, Andrea Disderi, entered Cashmere and travelled from Ladak to Lhasa—possibly by the very route which the Pundit had described, but his journal had only recently been recovered in Italy, and had not yet been published. In the last century a Dutchman, Vanderput, travelled from India through Lhasa to China, and back again the same way, but had left hardly any record of his journey, and that little would have been totally unknown but for the exertions of Mr. Markham when compiling his book on Tibet. The next journey was by Bogle to the north of the Sanpu; and, forty years later, Mr. Manning reached Tibet. Why he went there it was difficult to understand, even from his own journal, but he did get there, and was arrested and sent back again. The next account was that of Huc and Gabet. They also were not geographers, and they added almost nothing to the geographical knowledge of the regions, though the book which the Abbé Huc published was one of the most amusing that ever was written. It therefore remained for the Pundit Nain Singh to give an accurate basis for the maps of Tibet. That was the great achievement which he had accomplished with very much toil, and with the sacrifice of his own health, and which was the great reason why the Geographical Society had awarded him their Gold Medal.

Sir HENRY RAWLINSON said he was particularly glad to attend on the present occasion, because, independently of the interest which, in common with all geographers, he took in the discovery of previously unknown tracts of Central Asia, he had a personal interest in the Pundit's journeys. Ten years ago, when Colonel Montgomerie brought the first journey of the Pundit before the notice of the Society, he was the means of obtaining from the Council of the Geographical Society the presentation of a gold watch to the Pundit, in recognition of his valuable services to the cause of Geography. He had, therefore, always felt that he was to a certain degree sponsor for the Pundit in his geographical work. He had always followed the Pundit's work with deep and ever-increasing interest, and he was delighted to find that his career had now culminated in his carrying off the blue ribbon of geographical science—the Gold Medal of the Royal Geographical Society. But while he gave every possible credit to the Pundit for his perseverance, his gallantry, and his skill, he could not forget the claims to consideration of the Department of the public service which founded the school to which the Pundit belonged. It was found to be a crying want in the geographical researches of India that Europeans were unable to penetrate into those countries which lay on the north and north-western frontier, and it occurred to the heads of the Department of the Trigonometrical Survey that it would be desirable to found a school for the purpose of promoting discovery by native agents. It was a very difficult task to commence with, but, by degrees, the Department succeeded in training both Muhammadans and Hindus for the purpose of exploration; and he had always felt that great credit was due to those officers, especially to Colonel Walker, the head of the Trigonometrical Survey; Colonel Montgomerie, who really founded the school of native explorers; and Captain Trotter, who not only completed the work of his predecessors, but also utilised the results which they had obtained. Such men as the Pundit, the Havildar, and the Mullah were invaluable in traversing unknown countries, where Europeans were unable to show their faces. They collected facts, recorded distances, and made observations for altitude and latitude: none of them had, however, as yet been able to determine a longitude. The taking of a lunar appeared to be beyond the power of any native surveyor. The longitudes had been arrived at by cross routes and dead reckonings, so that the position of Lhasa had not yet been scientifically ascertained. The latitude was determined by the Pundit on his former visit in 1865, when he spent three months there. Great credit was due to the officers who had sent out these native explorers, and on their return had tabulated their observations and memoranda.

The PRESIDENT said he had hoped that Sir Douglas Forsyth would have been able to attend the meeting, but a letter had been received from that gentleman stating that he was suffering from a serious cold, and could not be present. He had, however, written a few observations, pointing out that Nain Singh had been one of his own *employés*, and was engaged in carrying out a system of exploration which Captain Trotter designed.

Mr. DELMAR MORGAN and Mr. TRELAWNEY SAUNDERS also took part in the discussion.

Anniversary Meeting, 28th May, 1877.

THE meeting was held in the theatre of the University of London, Sir RUTHERFORD ALCOCK in the chair.

After the reading of the Report of the Council, the PRESIDENT proceeded with the presentation of the awards. The Founders' Medal was awarded to Captain Sir George Nares, for having commanded the Arctic Expedition of 1875-76, during which the ships and sledge-parties respectively reached a higher northern latitude than had previously been attained, and a survey was accomplished of 300 miles of coast line, facing a previously unknown Polar Sea; also for his geographical services in command of the 'Challenger' Expedition.

In returning thanks for the gift, Sir George said that he accepted it as a token that the work he had performed had met with the approval of so distinguished a body as the Royal Geographical Society, and that it would henceforward be his endeavour to bear worthily the very high distinction which had been conferred upon him.

The Victoria or Patron's Medal was awarded to Pundit Nain Singh, for his great journeys and surveys in Tibet and along the Upper Brahmaputra, during which he had determined the position of Lhasa, and added largely to our positive knowledge of the Map of Asia. In the absence from this country of Pundit

Nain Singh, Colonel H. Yule, C.B., was called upon to receive the Medal on behalf of the Pundit, and in doing so he said that the man who beyond all others ought to have occupied the position of recipient was Colonel Montgomerie, and he was sure that nothing but ill health could have caused that gentleman to be absent on an occasion so interesting to him. Not only had Colonol Montgomerie given Nain Singh the most essential part of his training, but he was himself one of the most distinguished Himalayan explorers and surveyors. He should, therefore, by the leave of the Society, communicate the Medal through Colonel Montgomerie. Colonel Yule affirmed that the observations of the Pundit had added a larger amount of important knowledge to the map of Asia than those of any other living man, and his journals formed an exceedingly interesting book of travels.

A Gold Watch was next presented to Captain A. H. Markham, R.N., for having commanded the Northern Division of Sledges in the late Arctic Expedition, in the course of which he planted the Union Jack in 83° 20′ 26″ N., a higher latitude than had ever been reached by any previous Expedition. In expressing thanks for the honour conferred upon him, Captain Markham said that though he had been selected as the recipient of the more substantial part of the honour, he knew it would be appreciated by his companions, without whom he should not be placed in the position he then occupied. He could not help thinking also, that apart from his having planted the Union Jack in the highest Northern latitude yet reached, he had been selected for this honour because he was the senior officer of the sledging parties of the Expedition, and he should regard it as an acknowledgment on the part of the Royal Geographical Society of all the services which those parties had rendered.

The annual Prize Medals offered by the Society to the Public Schools were awarded as follows :—

Physical Geography.—*Gold Medal.*—Walter New, Dulwich College. *Bronze Medal.*—Arthur Smyth Flower, Winchester College. *Honourably Mentioned.*—John Chisman, City of London School; J. A. Robinson, Liverpool College; Frank Stanton Carey, Bristol Grammar School.

Political Geography.—*Gold Medal.*—William John Newton, Liverpool College. *Bronze Medal.*—John Wilkie, Liverpool College. *Honourably Mentioned.*—Arthur Reed Ropes, City of London School; William Wallis Ord, Dulwich College; Samuel Fowler Blackwell, Clifton College; George Arnold Tomkinson, Haileybury College; Henry Colthurst Godwin, Clifton College.

The awards having been presented, the PRESIDENT next proceeded with his Annual Address, at the conclusion of which a vote of thanks was proposed by Mr. F. Galton, and seconded by General Strachey, which was unanimously agreed to.

Meeting of June 12th, 1877.

SIR RUTHERFORD ALCOCK. President, in the chair. The paper of the evening "On Journeys up the Niger and Notes on the Neighbouring Countries," by Bishop Crowther, was read by Mr. Hutchinson, Secretary of the Church Missionary Society. The paper described the bishop's journeys between 1841 and 1871 in Western Africa and along the basin of the Niger, the villages of the natives, and the different tribes scattered about the neighbouring countries. The actual extent of the delta of the river was still uncertain. It was a vast tract of marshy country, with a coast line of 120 to 150 miles in width, and there was little doubt that the affluents of the river on the south bank, if traced to their source, would lead to a rich field of discovery. By some short cut the Akpah tribes of the Adamawa had already found their way down to Fernando Po. In the course of a journey of 700 miles, Bishop Crowther had met with no less than thirteen different tribes, all speaking different languages, and some of them had evidently come down the Niger from remote distances either accompanying Muhammadan conquests, or in search of trade. The Housas were a most widespread tribe, and were met with between Cape Coast and Sierra Leone. Their language, which the bishop describes as beautiful, is understood by all the Muhammadans of the country. The other important language of that part of Africa was the Fulah. Trade routes of some importance meet the Egga on the Niger, the chief of which came from Tripoli across the Sahara, whence European goods were conveyed on the backs of camels, and were distributed in the neighbouring countries. One of the caravans which the bishop had met had two camels marked with the broad arrow, and he understood that they had belonged to the English Government at the time of the Abyssinian Expedition. It was the bishop's opinion that the good feeling of the rulers of the country towards the English was such as to afford opportunity for the introduction of British commerce.

After the reading of the paper, BISHOP CROWTHER said that he was certain that what had been done in that country to lead to that good feeling was the work of the Church missionaries. The Muhammadans had carried civilization among the tribes, and the people would have profited much more if the Muhammadans had carried charity with their teaching. But they were very oppressive. Their object was not so much to make proselytes as to annex territory. The moral influence of England was great among the tribes, and principally great because her work in the repression of the slave trade was known. The shiploads of poor men and women she had set free, and had carried back to their own country and to their own homes, had done more to make the name of England known among the tribes than any expedition could. An Englishman could now travel up the Niger and be received everywhere, and the natives would be responsible for his safety.

Mr. HUTCHINSON then gave a short account of the work done by the Church Missionary Society in Central Africa, and remarked that in the last expedition a party travelling to the Lake Victoria Nyanza, had passed over the same ground as that taken by Mr. Stanley, where, it appeared, there had been so much "unfortunate bloodshed." But the party had met with no hindrance, travelling was of the easiest, and the natives most friendly. The Society had now resolved to send out a small steamer, drawing only 3 feet of water, to push further into the interior, and afford assistance to Bishop Crowther to carry the missionary work more completely among the natives.

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PARIS GEOGRAPHICAL SOCIETY.

May 2nd, 1877.—M. LEVASSEUR in the chair. The Meeting was attended by the Emperor of the Brazils.

M. E. BOSSERE communicated the results of soundings made by Captain Exmelin, of the 'France,' on the eastern coast of Patagonia, and on the western coast of Nicaragua.

M. MESSEDAGHA, of Cairo, informed the Society that he had made a trigonometrical survey of Coele-Syria, on a scale of 1 : 200,000. This map was accompanied by a memoir, treating on the history, the physical geography, the statistics, and the archæology of the country. Several ancient monuments had been discovered by him, including the temple of Aelius Adrianus, dedicated to Diana, and the tomb of Lysimacus, the famous general of Alexander. This tomb stood on a hill in the Anti-Lebanus, and could be reached only by means of ropes. He had not succeeded in removing the slab which covered the sarcophagus, for want of suitable tools. Within the niche occupied by the sarcophagus was to

be seen a medallion of the general, with a Greek inscription referring to him. He had likewise discovered the tomb of Cassius Arianus, one of Julius Cæsar's generals.

M. UJFALVY, in a letter dated Turkistan, 7th March, informs the Society that he has visited the ruins of Janekend, where he discovered enamelled bricks and coins. Yanikurgan, Sauran, and Kash-Mizgil yielded but little, but at Turkistan he secured several interesting remains of pottery and other articles. M. Ujfalvy is accompanied by his wife.

Commandant PERIER rendered an account of the geodesical operations carried on in France and Algeria, for the purpose of measuring a degree of the meridian.

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LYONS GEOGRAPHICAL SOCIETY.

COLONEL CHAMPANHET read a paper on Central African Railways, with special reference to the project published by Rohlfs, in the *Mittheilungen*. The realization of this project, he thought, would offer no advantages whatever to France, but was in reality conceived for the sole interest of Germany, who would, no doubt, like to "purchase" the Vilayet of Tripoli, with a view to its colonization and exploration. A railway from Algeria to Timbuktu certainly deserved the preference, as far as France was concerned. The English, it was said, desired to found an empire in Western Africa, with the view of attracting to it the commerce of the Sudan, whilst the Egyptians were pushing their railways into the heart of the continent. France must not remain impassive under the circumstances, and the Saharan railroad to Timbuktu and the mouth of the Senegal ought to be taken in hand without delay.

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LISBON GEOGRAPHICAL SOCIETY.

March 27th, 1877.—The Portuguese Committee for the exploration and civilisation of Africa was elected, Viscount de S. Januario is its president, Dr. B. du Bocage and A. A. Teixeira de Vasconcellos, Viscount Soares Franca and Comdt. F. O. Chamico are the vice-presidents, and MM. L. Cordeiro and R. A. Pequito the secretaries. A national subscription is to be started immediately. The committee propose to support Portuguese travellers, and, more especially, M. J. d'Anchietta, the Naturalist.

May 1st, 1877.—The reform of geographical teaching in schools formed the subject of discussion. The school books approved by the Board of Public Education were described as wretched productions. In one of them a mountain was said to be a "great elevation of the land," and a hill as a "little mountain." In describing the aurora borealis, the author added that this phenomenon was said to have been observed also in the Southern hemisphere, but that he doubted this.

DR. RIBEIRA read a paper on the sanitary condition of Africa, with reference to exploratory expeditions.

M. L. CORDEIRO reported on the excavations made by Dr. Martins Sarmiento at S. Romao de Briteiros, where tradition places the Lusitanian or Celtiberian *Citania*. About forty huts and four lines of fortifications have already been laid open.

MM. SERPA PINTO, HERMENEGILDO CAPELLO, and ROBERTO IVENS, have been selected by the Portuguese Government to proceed to Africa as explorers. They will start on the 5th July for the Congo, and endeavour to reach the capital of the Muata Yanvo. Another expedition left on the 5th of May, under the leadership of M. Gorpao. Its object is to make surveys for a railway to be constructed between Loanda and Ambaca.

ITALIAN GEOGRAPHICAL SOCIETY.

May 13th, 1877.—The PRESIDENT opened the proceedings by introducing Signor CARLO PIAGGIA, the illustrious Italian traveller. Signor Comm. CORRENTI gave a short summary of Signor Piaggia's courageous expeditions into Central Africa during the years 1851-1876. He then called upon Signor MATTEUCCI to read Signor Piaggia's account of his latest visit to the Victoria Nyanza. It was a relation of considerable interest, as completing the geography, zoology, and botany of that important region.

Dr. BRUNIALTI next read some notes on other late African discoveries, referring specially to Stanley's journey to Tanganyika.

Comm. CORRENTI then read a letter from the captain of the 'Scylla,' containing news of the expedition lately sent from Italy to rejoin Antinori and his companions, stating that the former were encamped at Zeila on the 27th April, making final preparations for their departure thence for Schoa.

The PRESIDENT wound up the proceedings by offering the thanks of the meeting to Signor Piaggia, and by the proposal that the Society should confer their medal on him, which met with unanimous approval.

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HAMBURG GEOGRAPHICAL SOCIETY.

May 3rd, 1877.—Dr. KIRCHENPAUER in the chair.—Dr. PECHUEL-LÖSCHE read a paper on Loango, which was illustrated by water-colour drawings made on the spot, and an anthropological collection.

Herr T. J. REPSOLD then described the Mangues of Santos, in which he had made a lengthened stay.

June 7th, 1877.—Dr. KIRCHENPAUER in the chair.—The President gave a description of the natural history collection made by members of the West Siberian Expedition, and now exhibited at Bremen.

Herr FRIEDRICHSEN reported on recent geographical publications, including Baron Richthofen's work on China, on the progress of Dr. Andreas' expedition to Persia, and on the earthquake which recently occurred at Iquique, producing an immense earthquake-wave.

Dr. FRIEDLANDER read a paper on the relations between Russia and Turkey in historical and ethnographical respects.

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